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Improvement in Hot-air Engines.

The attempt to substitute air for steam, as a motive power, is not so recent as is generally supposed, patents having been granted in this country as far back as 1824, for atmospheric engines. It appears to have been first used, in a really efficient form, by Rev. Dr. Stirling, of Scotland. He patented an air engine in 1816, and made one which was used for pumping, in 1818, that worked well for a short time. In 1827 Messrs. Parkson & Crosley, of City Road, London, England, constructed an air engine. In 1833 Lieut. John Ericsson, then residing in London, reduced to practice his long-cherished project of a caloric engine, and submitted the result to the scientific world. The invention excited very general attention, and lectures in explanation and illustration of its principles were delivered by Dr. Lardner, Prof. Faraday, Dr. Andrew Ure, and others. In 1837 Sir George Cayley constructed an air engine. In 1851 Ericsson patented his invention in this country, and in 1852 he built the ship *Ericsson*, of 2,000 tuns, driven by his machine, the working cylinder of which was 14 feet diameter, with six feet stroke.

Since then the engine has been considerably improved by himself and others, and it is now recognized as a cheap, safe, and efficient generator of power, within certain limits, and is extensively used in this country. The most perfect form of the engine, with which we are acquainted, is that shown in the accompanying engraving, known as the Roper Caloric Engine, which was first illustrated in No. 7, Vol. VIII., SCIENTIFIC AMERICAN, since which time it has been greatly improved, as the accompanying engraving and description indicates. This engine should not be confounded with other air engines that depend upon heated air alone. Mr. Roper claims to have accomplished, in his engine, what others have attempted and failed, and what experienced engineers claim necessary to a successful caloric engine, viz.: forcing the air directly into the fire, and thereby combining the power of expansion with the power and products of combustion. This result is accomplished, in this engine, by the use of an air pump, close, air-tight doors to the furnace, and poppet valves, arranged as follows:

The air, to supply oxygen for the combustion, is pumped in by pump, A, the carbon is burned rapidly and completely, under pressure, and the resulting carbonic acid gas and uncombined hydrogen gas from the air pass from the generator, or fire box, to the piston by use of poppet valves, B, which act the same as steam marine engine valves.

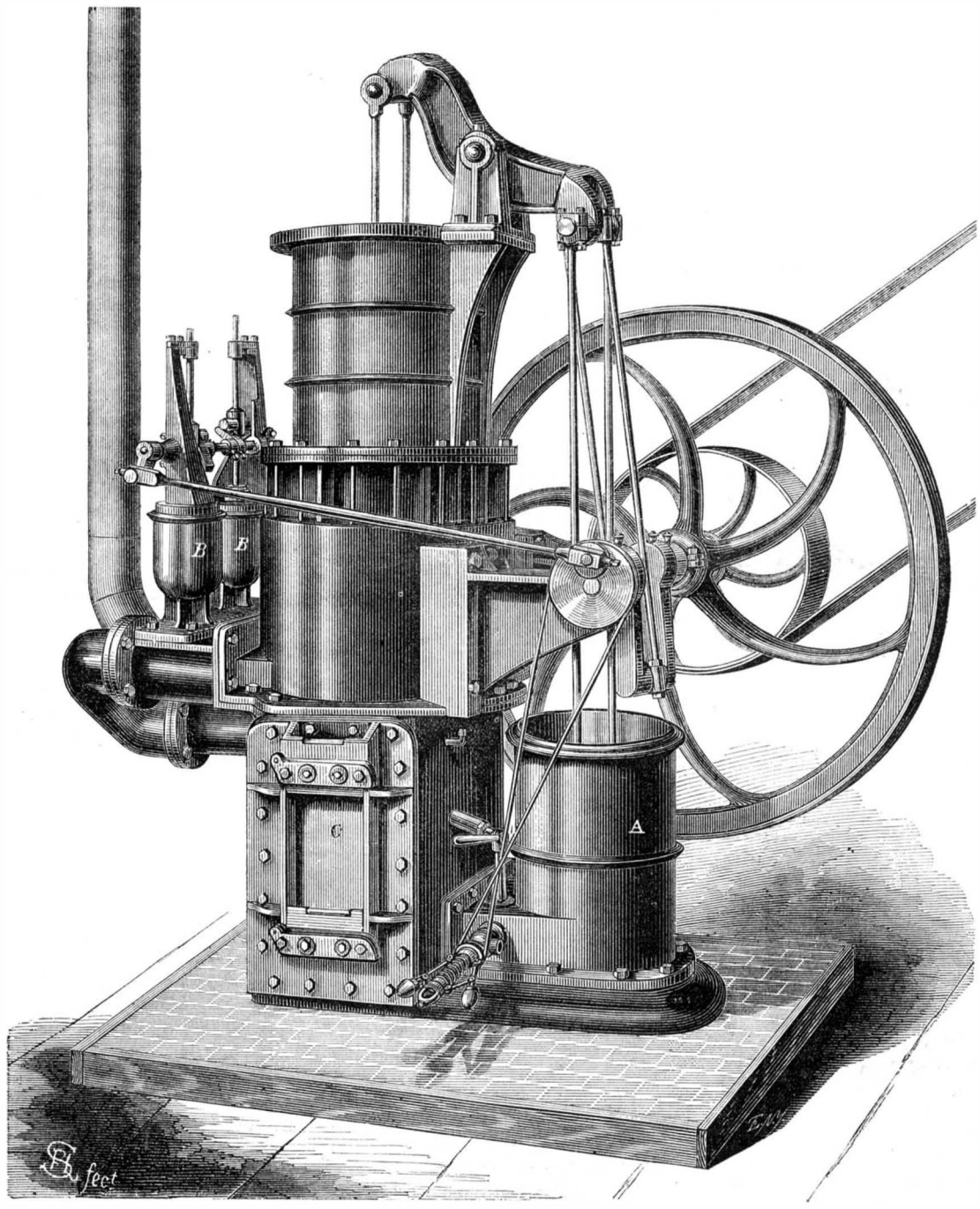
With this arrangement a quiet, steady pressure is continued in the fire-chamber, or air boiler, and the great difficulty experienced in others, of a blast carrying ashes and too great a heat into the cylinder and burning out packings, is fully obviated. The inside of the fire-box, C, is lined with heavy fire-brick throughout, and a wall of non-conducting material, three inches thick, between the brick and outer jacket, prevents injury to the iron and radiation of heat into the room The late important improvements do not, however, touch the principles of construction so much as the mode of application. At first, Mr. Roper placed his air-pump upon the top of the engine, taking the air, by the use of a pipe, through the casing to the fire-box. In this way the air became partially expanded before reaching the fire. In the improved engine he enlarged the air-pump and placed it on the base near the floor, using the coldest air more direct and with much less friction in clearances, by this means obtaining at once nearly double the power by the same size engine. Next he employed two dampers, one admitting all of the air into the fire-chamber, under the fire-grate, and the other over the fire. The first to be used in time of building the fire, and when it was low, and the other after the fire was complete. Thus the engine can be started as soon as the kindling wood begins to burn. The pump and check valves are made of leather—very simple contrivances. The bearings and all parts of the engine are made stronger and more durable than at first.

One of the greatest improvements obtained is a perfect governor or regulator. The old governor, which was connected with the air-pump, could not be changed so as to vary the speed materially, and did not hold the engine steady when work was thrown on or off suddenly. The present regulator is not much more or less than a safety valve, placed back of the check, taking air from the pressure, in the generator; and by use of a simple thumb screw, the engine can be made to run with the same power from 40 to 120 revolutions per minute, as required, and that with a steady, smooth, unvarying motion, and nearly as noiseless as steam.

We have examined several of these engines, driving different machinery very successfully, of one, two, and four-horse power; and, by inquiry, we find the amount of coal used is about 40 lbs. per day for a horse power, and that the engines fully show the amount of power claimed.

A one-horse power machine weighs about 2,000 lbs., a two-horse power 3,000, and a four-horse power about 5,000 lbs., so that they are readily moved. No water is required in these engines, there is no boiler to explode, and no extra rates demanded for insurance. A boy can manage one as well as an experienced engineer. The engine is the subject of a number of patents.

All orders or applications for information should be addressed to the Roper Caloric Engine Co., 49 Cortland st., New York city, where the machines may be seen.



THE ROPER IMPROVED CALORIC ENGINE.

WHAT is one man's salvation is another one's bane; this old saying is an axiom. Those who urge their remedies or medicaments on others do not understand that in unanimity or oneness there may be diversity.

CONTRAST AND ADMIXTURE OF COLORS.

From a paper on the science of color, by W. Benson, an abstract of which appears in the *Building News*, we collate the following statements relative to the effect produced by the juxtaposition of colors, which are of great value to all engaged in decorative arts. These statements are based upon deductions from the study of prismatic colors, and are confirmed by all sorts of experiments made with the colors of pigments. We may test the colors of pigments with the prism in a beautifully simple way. We have merely to cover a small part of a strip of white paper with the pigment, and view it over a dark cavity, through the prism, and we see the spectrum of the pigment color adjoining to that of the white, and detect at once the rays which are absorbed or extinguished by the pigment, and those which it sends to the eye, to which its color is due. Thus, with respect to yellow, which many will still maintain to be a primary color, unconvinced by the experiments on the combination of the prismatic rays (which show that the best yellow is produced by throwing together all from the first red to the last green ray); if we analyze the color of aureolin, of chrome yellow, or of king's yellow, or the petal of any bright yellow flower, we uniformly find that, the better and clearer the yellow, the more perfectly the object reflects all the red and all the green rays, absorbing only the blue.

Hence, if blue is a primary color, it is difficult to see how it can be supposed that a color produced by all the other rays of the spectrum, is not made up of both the other primaries combined, whatever those primaries are.

Colors intermediate between two pigments cannot be obtained by their admixture. Gamboge and Prussian blue, for instance, make, by admixture or superposition, a green, darker than either the yellow or the blue of those pigments; the scientific method gives, as their intermediate color, a gray of mean brightness, in agreement with the results obtained by experiments on the combination of the prismatic rays. So, also, it does the colors of king's yellow and cobalt, or lemon yellow and French blue or ultramarine.

Mr. Benson claims that facts determined by his experiments on the combination of prismatic rays, as well as those upon pigments, confirm the opinion that red, green, and blue are the primary, and sea-green, pink, and yellow the secondary colors.

In perfect agreement with these facts, are all those apparent changes of color which are perceived when the retina, having been strongly excited by some one or other color, becomes less sensible to it than usual, and every object to which we direct the eye appears, therefore, more or less tinged with the complementary color, as if a wash had been laid over it. For it is always found that in an eye excited by red, by green, or by blue, objects appear tinged with sea-green, with pink, or with yellow, and the reverse; and that by intermediate colors intermediate effects are produced.

Some of these effects have been otherwise described by several writers; it is usual, for instance, to hear it said that red tinges the adjoining colors with green; but this is not correct, unless the one be a pink-red, or crimson, and the other a sea-green green. So again, it is usual to say, that blue and orange mutually deepen each other; but, for this to be true, the blue must be of a sea-green blue or azure hue, and the orange must be yellowish.

The most careful experiments, made by looking steadfastly at spots colored with those pigments which best represent the principal compounds of the prismatic colors, and brilliantly illuminated upon a black ground, and then suddenly directing the eye to a perfectly neutral gray ground, will always clearly show the gray surface darkened and modified in hue in ac-

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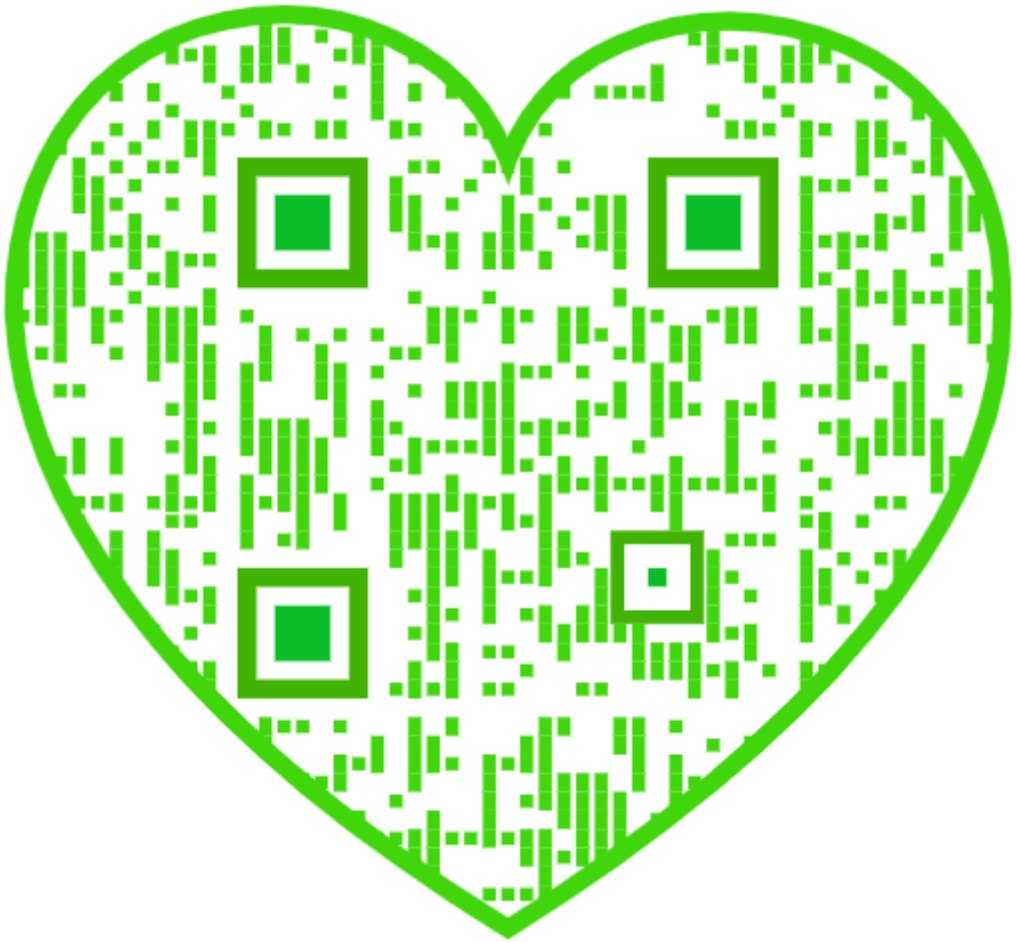

cordance with what I have already pointed out as the real or natural complementaries. Thus, an eye affected with bright red or scarlet, like that of vermilion, turns the gray into a grayish sea-green of the hue of verdigris; one affected with green, like that of emerald green, turns it a grayish pink, of about the hue of rose madder; one affected with blue, like that of cobalt, turns it into a grayish yellow, of the hue of king's yellow, and the reverse. The same effects are seen in the shadows cast by a sunbeam which has passed through strongly-colored glass, upon a gray surface otherwise illuminated by a neutral light; and in many other ways, if due precautions are used. And no doubt the peculiar improvement in depth, which is evident in truly complementary colors when viewed in juxtaposition, the eye glancing rapidly from one to the other of them, arises from the same cause. It is evident, therefore, that the eye itself is so constituted as to agree, in this respect, with the deductions of science concerning the actual relations of colors.

The attempt to reconcile these obvious ocular effects with the common doctrine as to what colors are complementary to each other has led some to regard the deep prismatic blue, which Newton called indigo, as being violet in hue, and the deep prismatic red as being an orange red.

The terms used to distinguish colors are among the most indefinite in all languages; and the loose way in which they are applied, and the different meanings attached to them by different authors, would lead one to suppose that our color-sensations are so different in different persons, and so variable in the same, that they are more fanciful than real, and that no certainity is attainable in them. Yet, in fact, if we except the comparatively few persons who are only capable of the sensations of yellow and blue, and those whose eyes are less sensible than they should be to red, there is a wonderful uniformity and certainity in the sensations excited by light. Only let the rays which enter the eye be the same in quality and quantity, and let the eye be in the same normal condition, without any present or very recent strong excitement, and we may rely upon the results being the same.

But the difference between the new doctrine and the old is more than a difference of terms, for the utmost latitude of interpretation cannot reconcile them.

Sir J. G. Wilkinson asserts in his work on "Color and Taste" that though red and blue in juxta-position have the appearance of purple, and yellow placed next to red gives it an orange hue, the same illusion is not caused by the contact of the other two primary colors, blue and yellow, and these do not look green when in juxtaposition, except in certain cases. Nor is the change then so marked as when blue and red, or yellow and red, are in contact. And this is one of many proofs that all the three primary colors are not under the same conditions, in relation to each other. It is not, therefore, necessary to lay down the same general and invariable rule respecting the three primaries, that "in making new patterns or ornaments, red and blue should not join, nor yellow and red, nor yellow and blue," as though the three combinations were exactly similar, and subject to the same laws. For yellow and blue do not deceive the eye to the same extent as the others, when in juxtaposition. Nor has red with green the same effect as red with blue and yellow, and still less have red blue and yellow the same effect as these three colors when united in one,—that is, according to the theory which the author received, they have not the same effect as white.

Such anomalies as those noticed in this extract are the necessary consequences of an erroneous theory. Of course, blue and yellow cannot be treated in the composition by the same rules as blue and red; for blue is complementary to yellow and not to red. Still less can yellow and red be treated by the same rules as yellow and blue; for yellow harmonizes with red, itself containing the full red in conjunction with the full green, while it contrasts as the opposite color to blue. No wonder that red, yellow, and blue together have not the same effect as red and green together, nor yet the same effect as white; for the mean of the first combination is always reddish, and of the second yellowish, and neither of them white or netural, whatever proportions are taken.

We ought, in the opinion of Mr. Benson, to treat red, green, and blue under the same rules as primary colors, and sea-green, pink, and yellow under the same rules as secondaries, if only we bear in mind the differences in the depth and clearness of the pigments we use to represent them; these, of course, modifying the effects in a large degree. Two primaries of similar depth may please the eye when side by side, while the same two, equally true in hue, but not alike in depth, may fail to do so. A great step will assuredly be gained if we establish correctly the hues of the three simple color-sensations, and of their complementaries; for these, together with black and white, will give us the eight principal colors upon which to work, and will enable us to determine all the intermediate colors correctly, and to arrange them all with due regard to their natural gradations and contrast of every kind.

Tolling Great Bells.

A new method of hanging very large bells has been tried at Worcester, England, it would appear with perfect success. The bell upon which the experiment was tried weighed four and one-half tuns. The plan is to make the gudgeons upon which the bell is hung, V-shaped, like the bearings of an ordinary scale beam. These rest on brasses very slightly hollowed. The friction was so greatly reduced by this method, that, according to the *Builder*, this ponderous bell was tolled for afternoon service on Sunday, 17th January, by the Rev. H. T. Ellacombe, that gentleman using only one hand, although a small man and nearly 80 years of age. It is said to be easier than pulling the clapper by a rope, beside being less likely to crack the bell. Another great advantage is that the tone of the bell comes out much more grandly than by clappering. No wheel is required in this mode of bell hanging, the power being applied by a lever fixed to the stock. The gudgeons must not be lower than the top of the bell. The diameter of the mouth of the bell alluded to was seventy-six and one-half inches.

HOW GOLDEN HAIR IS OBTAINED.

Every one who is observing of the peculiarities of fashion, must have noticed the increase of golden hair displayed in such profusion by the belles upon the promenades and elsewhere. It has been a subject much discussed and considerable curiosity has been displayed in regard to the way in which the thing is accomplished. It is quite plain that some artificial means must be employed. Mr. Henry Matthews, F. C. S., has been letting the cat out of the bag; in the London *Chemist and Druggist* he gives the results of some analyses of "Golden Hair Fluids," and for the benefit of our fair readers, as well as the curious of the male sex, we transcribe them.

1. AURICOMUS OR GOLDEN FLUID.

This, to quote from its label and bills, "though harmless as pure water, has the astonishing power of quickly imparting a rich golden flaxen shade to hair of any color. Unlike other preparations, it has neither spirit nor alkali in its composition," etc.

The auricomus is a clear, colorless fluid, smelling slightly of nitric acid, this odor being almost overcome by the perfume which the mixture contains. It certainly does not contain any alkali, inasmuch as its reaction is strongly acid; and it consists entirely of *dilute nitro-hydrochloric acid*, the non-volatile constituents not amounting to one grain in a bottle containing 2·25 fluid ounces, which, upon analysis, furnished 0·955 grains of actual hydrochloric acid (HCl); corresponding to 23·3 minims of the acidum nitro-hydrochloricum dilutum of the *British Pharmacopœia*, or 10·35 minims of dilute acid in one fluid ounce of mixture.

2. ROBARE'S AUREOLINE.

According to the label this is "free from all objectionable qualities," etc. The name of this preparation appears to have been borrowed from that of the well-known golden yellow pigment introduced and manufactured by a celebrated firm of artists' color manufacturers in Rathbone-place.

The Aureoline, like the Auricomus, is a colorless fluid having a strongly acid reaction and an odor of nitric acid, which the amount of perfume used does not conceal, and it also consists of dilute nitro-hydrochloric acid; a bottle containing 3·75 fluid ounces furnishing 1·74 grains of actual hydrochloric acid, an amount equivalent to 42·4 minims of dilute nitro-hydrochloric acid of the *Pharmacopœia*, or 11·3 minims of the dilute acid in one fluid ounce of Aureoline.

3. NICOLL'S GOLDEN TINCTURE.

The label of this article has the merit of not making any professions as to the perfect harmlessness of its ingredients, simply stating that it is "for giving a brilliant golden shade to hair of any color."

This preparation, like the preceding, is a colorless fluid, but containing a very slight deposit, smelling of nitric acid, and having a strongly acid reaction, consisting of dilute nitro-hydrochloric acid, together with a trace of sulphuric acid, the amount of non-volatile constituents being inconsiderable.

A bottle containing 2 fluid ounces gave 0·5 grains of actual hydrochloric acid, corresponding to 12·1 minims of the dilute nitro-hydrochloric acid of the *Pharmacopœia*, or equal to 6 minims of the dilute acid to one fluid ounce of the compound.

4. ROSS'S SOL AURINE.

On the wrapper of this we are told that "The production of a preparation which shall imitate nature in its loveliest aspect with regard to that tint of hair so fashionable in ancient classic ages," etc.,—"and which shall at the same time be harmless, has been a desideratum,"—and the reader or purchaser is left to infer that the said "desideratum" has been attained in the "Sol Aurine."

The Sol Aurine, which has a strongly acid reaction and smells most distinctly of nitric acid, is a clear, colorless fluid, containing a considerable amount of a transparent gelatinous deposit. Like the other preparations examined, it consists principally of dilute nitro-hydrochloric acid, the transparent deposit consisting of precipitated silica. A bottle holding 2·5 fluid ounces furnished 2·77 grains of anhydrous hydrochloric acid, corresponding to 67·2 minims of the acidum nitro-hydrochloricum dilutum, B. P., or equal to 26·8 minims of *Pharmacopœia* acid per fluid ounce of Sol Aurine. Other than the deposite of silicious hydrate before mentioned, the non-volatile constituents were inappreciable in amount, and were, as in the other fluids examined, such as would be evidently due to the use of either common water or impure acids in the preparation of the washes.

In conclusion Mr. Matthews remarks:

"There is little doubt that all of the above preparations would effect the purpose for which they were intended, the principal agent in all of them being the nitric acid, the effect of which is possibly aided by the bleaching power of the very small portion of nascent chlorine derived from the decomposition of the hydrochloric acid by the nitric acid.

"With regard to their use being safe or otherwise I am not prepared to speak positively, but I have been informed by a medical friend, Mr. Charles Matthews, of Southampton-street, Strand, that he has, in the course of his practice, been called upon to attend ladies who, by the incautious use of golden hair fluids, had produced burns from portions of the fluid falling upon their necks and shoulders.

"I am, however, bound to say that I was unable, with any of the preparations mentioned above, to produce even a slight stain upon the skin; but, as of course, I could only experiment upon myself, I cannot say what might be the effect on the whiter and more delicate surface of the necks and shoulders of the fairer sex.

"In conclusion, I would observe that, as far as the preparations examined are concerned, it is satisfactory to find that they contain no compounds of antimony or arsenic."

PRACTICAL SUGGESTIONS ON TANNING LEATHER.

BY C. GILPIN.

(Continued from page 178.)

THE ADVANTAGES OF QUICK-LIMING.

Another subject to which I gave some attention, while paying my respects to the tanners, was that of liming, and observed that a wide difference existed among them in relation to the time occupied in putting the hides through this process, and divesting them of the hair, which is of course the object of liming, primarily considered. Some of the best and most extensive manufacturers are so thoroughly satisfied of the injurious influence of lime upon the gelatin of the hide, that they have abandoned the use of lime altogether. That much of the gelatin can be extinguished by its too free application to the hide there now remains no doubt upon the minds of those who have fully tested it; others claim that by allowing the hides to remain in the lime from six to ten hours, they avoid any injurious influences. The superintendent for the firm of Craigan & Co., Chicago, Ill., informed me that he only allowed the hides to remain in the lime eight hours, during which time they are suspended on reels, kept by the application of steam up to 110° Fahrenheit, and the position of the hides frequently changed by turning the reels, after which they are taken off and placed in a pool containing pure water of a few degrees higher temperature, where they remain for twenty-four hours, during which time the water is changed two or three times, but constantly kept at the necessary temperature, after which the hair is easily removed without injury to the hands of the workman.

The advantages claimed for this method are, that the hide does not by this rapid movement become so thoroughly impreganted with lime, consequently less loss is sustained in gelatin. This is to be accounted for upon the principle, which perhaps is not generally known to those who have given but little attention to the influence of lime upon animal matter in a chemical relation, that by bringing the hide in direct communication with caustic lime and allowing it to remain too long, the texture and strength of the fiber are impaired to a greater or less extent, or in proportion as the lime is allowed to penetrate the hide, entering the pores and remaining in them in the form of caustic, carbonate, or lime soap, and cannot be entirely purged out by any amount of fulling, working, or baiting, without destroying a portion of the gelatin of the hide; and which was dislodged under the primitive method of working the stock through the beam house by low baiting, at the expense of a large portion of the gelatin, and was mainly the reason why the gain was so small in those days when thirty-five to forty per cent was considered all the best hide was capable of. Another evidence of the advantage of low liming, which is known to all practical tanners who have given the subject their attention, is, that all high limed leather is not only loose, and pervious to water, but will not produce the amount of gain that hides will that have been low limed, or divested of their hair, through the sweating process; and under any process tanners should always bear in mind, that it is important that those who have charge of this department should not only be skilled thoroughly in their art but be constantly on duty, and observe closely the condition of the stock while passing through the Beam House; and at the very earliest indication manifested by the hide, of yielding up the hair, it should be removed from the influence of the lime at once, and placed in a soak containing clean water, at a temperature a few degrees higher than the lime liquor they are taken out of, for the reason that it not only prevents the pores of the hide from contracting, but slightly expands them and aids the hide in its effort to give up the hair; this will also avoid setting the hair, which is often the case, when the hide after being taken out of the lime, is thrown into cool water; and by wrenching the hides in the pool through two or three baths of warm water the lime is purged out without the loss of gelatin which is incurred through the wrenching wheel or fulling stocks, while the hide is in this loose and porous condition; at which stage of its progress, great care should be observed that its substance is not wasted; for therein consists in a large degree the profit.

While much has been said upon the subject of gain made by the manufacturer, I took considerable pains to inform myself upon this subject, also the average length of time occupied in tanning out a stock of sole or belting leather, and am satisfied, basing my calculations upon the most reliable data, that the average gain made throughout the entire fraternity, is not over fifty per cent, and the time required to tan out the stock, six months.

Some tanners make sixty and as high as sixty-eight per cent on some stocks, but these are the exceptions, and not the rule. And as further evidence of the influence of time upon the stock, I found that in every instance where the greatest gains were made the hides had either been sweat or very low limed. It is supposed to be generally known that a new lime is more caustic than one that has been made for some time, whether it has been used or not; and will to a considerable extent bind the hair during the first few hours, rather than cause the hide to yield it up. This is caused by the influence of the caustic upon the cuticle of the hide, which, being very delicate, shrinks or contracts to a certain extent when brought directly in contact with the strong alkaline properties of the lime; this can be modified to a great extent, by allowing the

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lime to remain in the vessel in which it is slacked, for at least twenty-four hours. The water should be placed in the vessel first, and the lime thrown into it, and after the contents are thoroughly slacked it should be frequently plunged or stirred to allow the oxygen generated by the slacking process to escape, or become modified, and thereby changing the caustic properties into what is chemically known as lime soap, the influence of which upon the hides is, to soften it, without distending the fibers so severely, as will fresh slaked lime.

Probably most practical tanners who have given the beam house much attention, have observed one fact, that when a pack of hides is taken from a new lime, they present a stiff, harsh appearance and feel, and the hair does not slip as freely, although longer going through the process, as when put through a lime liquor that has been used for several months, and which turns the hides out in a soft, pliable condition, and as a consequence yields up the hair much more readily. Some tanners only make entirely fresh or new limes, two or three times during the year, because their experience has instructed them, that a hide is more thoroughly and rapidly denuded of hair, through the medium of an old lime, than in a fresh one; because the former is less caustic, and operates more directly upon upon the earthly matter deposited around the roots of the hair, and perhaps this is the reason why acids have been adopted by some, as a substitute for lime, as they are known to act more immediately upon the roots of the hair which are impregnated and surrounded with a material that partakes largely of carbon, which is to a greater or less extent imparted to the hair, and renders it almost invulnerable to decomposition. This element has a strong affinity for acetic acid, and is readily disolved by being brought in contact with it. Submitting these facts for consideration of the trade, we will pass on to give our view upon other matters no less important to the leather interest.

EXPLOSIVE COMPOUNDS FOR ENGINEERING PURPOSES.

NO. IV.

The most powerful opponents with which gunpowder apparently has to contend, are nitro-glycerin and gun-cotton, and this on account of the extraordinary amount of power they possess; indeed, under certain conditions, they develop an almost irresistible force. But it is just this attribute of resistless violence, which has hitherto rendered them the most unsafe, the most dangerous compounds that can be applied to practical purposes. Man loses all control over these agents, inasmuch as an accidental blow or a slight concussion may—nay, must—produce a violent and perhaps most disastrous explosion. It is of no avail to possess a material which does several times the work of any other adapted for the same purpose, if life and property are in momentary danger of destruction. That this was one of the perilous conditions under which nitro-glycerin and gun-cotton were employed, is evidenced by numerous accidents which have occurred within the last few years in connection with their application to blasting purposes. But, both these dangerous agents have, within the last twelve months, been brought under control, and their action has been so modified that they may now be said to possess all the conditions necessary to constitute a safe and highly efficient material for blasting purposes.

Taking them in the order to which they are referred to above, let us first examine the merits and demerits of nitro-glycerin which is one of the most remarkable materials employed to replace gunpowder as a destructive agent. This substance was discovered by Sobrero, in 1847, and is produced by adding glycerin, in successive small quantities, to a mixture of one volume of nitric acid of sp. gr. 1·43, and two volumes of sulphuric acid of sp. gr. 1·83. The acid is cooled artificially during the addition of glycerin, and the mixture is afterward poured into water, when an amber-colored oily fluid separates, which is insoluble in water, and possesses no odor, but has a sweet, pungent flavor, and is very poisonous, a minute quantity placed upon the tongue producing violent headache, which lasts for several hours. The liquid has a specific gravity of 1·6. and solidifies at about 5° Cent. (40° Fah.); if flame is applied, nitro-glycerin simply burns; and if placed upon paper or metal, and held over a source of heat, it explodes feebly after a short time, burning with a smoky flame. If paper, moistened with it, be sharply struck, a somewhat violent detonation is produced.

In 1864, Mr. Alfred Nobel, a Swedish engineer, first attempted the application of nitro-glycerin as an explosive agent. Some experiments were, in the first instance, made with gunpowder, the grains of which had been saturated with nitro-glycerin. This powder burnt much as usual, but with a brighter flame, in open air. When confined in shells or blast-holes, greater effects were, however, produced with it than with ordinary gunpowder; its destructive action is described as having been from three to six times greater than that of powder. The liquid could not be employed as a blasting agent in the ordinary manner, as the application of flame to it from a common fuse would not cause it to explode. But Mr. Nobel has succeeded, by employing a special description of fuse, in applying the liquid alone as a very powerful destructive agent. The charge of nitro-glycerin having been introduced, in a suitable case, into the blast-hole, a fuse, to the extremity of which is attached a small charge of gunpowder, is fixed immediately over the liquid. The concussion produced by the exploding powder, upon ignition of the fuse, effects the explosion of the nitro-glycerin. The destructive action of this material is estimated to be about ten times that of an equal weight of gunpowder, so that if we take 32,000lbs. as the average of work done by 1lb. of gunpowder, as stated in the early part of this paper, we get 328,320lbs., or about 146½ tuns, as the work done by 1lb. of nitro-glycerin. Therefore, although its cost is about seven times that of blasting powder, its use is attended with great economy, more especially in hard rocks, a considerable saving being effected by its means in the labor of the miners, and in the time occcpied in performing a given amount of work, as much fewer and smaller blast-holes are required than when gunpowder is employed. The material appears to have received considerable application in some parts of Germany and in Sweden; but, in England, it has not progressed beyond the stage of experimental trials.

Although nitro-glycerin appears to possess very important advantages over gunpowder as a blasting and destructive agent, the attempts to introduce it as a substitute for gunpowder, have been attended by most disastrous results, ascribable in part to some of its properties, and the evident instability of the commercial product. The explosion which occurred on board the West Indian Company's steamer *European*, will long be remembered by many. This distressing event happened on April 3, 1866, when the *European* was unloading her cargo alongside the railway company's wharf at Aspinwall. The force of the explosion was such as to tear away the upper parts of the ship, and to blow the plates off her sides. The wharf, too, which was some 400ft. in length, was literally torn to pieces, and about fifty persons killed, while many others were seriously injured. By the ship's bill of lading a number of cases of nitro-glycerin were proved to have been on board, and doubtless careless handling of these packages, by men who were ignorant of the dangerous nature of their contents, led to the catastrophe. As if to impress the public still more strongly with the peril attending even the mere transport of this destructive agent, another accident occurred on the 16th of the same month. Two oil-stained boxes, each measuring about 4 cubic feet, arrived at San Francisco by the Pacific mail steamer. They were removed from the ship into the city, in which they had no sooner been deposited than they exploded with a violence that shook the neighborhood like an earthquake, for a quarter of a mile around, and proved terribly fatal to human life. It was publicly stated that the boxes contained nitro-glycerin which was intended for sale to the mining companies in Nevada, Idaho, and Colorado. In Sydney, New South Wales, too, a tremendous explosion occurred on March 4, 1866, in the stores of Messrs. Molison & Black, in Bridge street, which were totally destroyed. The noise of the explosion is said to have very much resembled the discharge of artillery, while a column of the *debris* was thrown to a hight of about 150ft. A great amount of damage was done to the surrounding buildings, and property to a serious extent was destroyed. This explosion was traced to two packages of nitro-glycerin.

There is yet another danger attending the substitution of nitro-glycerin for gunpowder in mining, and this relates to its manipulation when being prepared for firing a shot. Although the oil may have been safely transported to its destination, there is no guarantee that its destructive energy will not be developed before it is placed in the hole which is intended for it. Indeed, there are instances on record which show how slight a circumstance serves to spread death and destruction around, even in the handling of this material. It should be observed that among other disadvantages, nitro-glycerin freezes at a somewhat high temperature, in which condition mere friction will explode it. A sad illustration of this fact occurred in 1867 at Hirschberg, in Silesia, where nitro-glycerin was being used in the boring of a railway tunnel. The oil was one day found to be frozen, and in this state was delicately handled, and fragments were detached by means of a piece of wood. In the bore holes the frozen nitro-glycerin exploded quite as well as the fluid. One day an overseer attempted to break up a lump of the frozen material with a pick. The result was a violent explosion of the whole mass, which caused the death of the incautious miner. Several accidents have also occurred in our own country since the introduction of nitro-glycerin, and many of those who were the first to experiment with it, have already given up its use. This material, therefore, was only worthy of utter condemnation for its fearfully dangerous and uncertain character, even under the most favorable circumstances. Its resistless energy is fully admitted, and its great value in this respect for mining operations duly recognized; but, inasmuch as it does not appear that there are any conditions under which it can be handled with safety, its use ought certainly to be everywhere prohibited.

AMBERGRIS.

This singular substance is one among those derived from animal sources that are employed in the perfumer's art, and although its origin would seem to preclude its use by the fastidious, the same objection would equally apply to musk, the product of the civet cat or musk deer, which if not an excretion is a secretion intended probably, as is the offensive liquid ejected by the skunk, as a means of defense. Ambergris, or "gray amber" as its name denotes, is simply and only a portion of the excreta of the sperm whale, *Physeter macrocephalus*, resulting from disease. It is considered generally to be a result of a morbid secretion of the whale's liver, and is probably produced also by other oceanic mammalia. It is usually found floating on the surface of the sea in those parts of the ocean most frequented by the spermaceti whale; a small barren island off the coast of Yucatan, having received its name of Ambergris from the quantity of that substance found on its shores.

Whale fishers look for it in the intestines of the whale, and its value is so great that whalemen pursue with eagerness the sickly cetaceæ although they promise a scant return of oil. It is amorphous, or in roundish pieces, frequently formed in layers, of a grayish color—whence its name—with streaks of whitish yellow, brown, or black. It has a waxy texture and when warmed emits a pungent odor. It is for this quality it is so highly esteemed. It has been sold for its weight in gold. It is very scarce and seldom appears except as "essence of amber" or "extrait d'ambre," forms of perfumery having this material for their base and bearing a very high price.

Its discovery is not at all new. It is pretty certain it was known as a rare perfume in the fifteenth century, for Sinbad, the sailor, being wrecked somewhere in the Indian Ocean says:

"Here is also a fountain of pitch and bitumen that runs into the sea, which the fishes swallow, and then vomit up again, turned into ambergris."

Piesse in his "Art of Perfumery" does not rank the perfuming value of this substance highly; for he says: "A modern compiler, speaking of ambergris, says 'it smells like dried cow dung.' Never having smelled this substance we cannot say whether the simile be correct; but we certainly consider that its perfume is most incredibly overrated; nor can we forget that Homberg found that a vessel, in which he had made a long digestion of the human fæces, had acquired a very strong and perfect smell of ambergris, insomuch that anyone would have thought that a great quantity of essence of ambergris had been made in it. The odor was so strong that the vessel was obliged to be moved out of the laboratory."

We cannot agree with Homberg, for when first, some twenty years ago (and recollections of scents are among the most tenacious), we tested some fragments just brought in by a whaling ship, we very much admired the aroma, but—we are also partial to musk.

It is generally found in small quantities of only a few pounds or perhaps ounces in weight, but large masses have been discovered, one weighing 174 lbs. having been purchased in the East Indies by the Dutch, and a mass of 237 lbs. being obtained by the French East India Company. Lately, however we read that Captain Timothy C. Spaulding, of the bark *Elizabeth* of New Bedford, while coming southwest of Madagascar, struck a very large sperm whale. On opening the whale they had the good luck to discover 285 pounds of ambergris—worth on the spot $20,000.

Another New Bedford whale ship, the *Herald*, lately brought home 71 lbs. of this substance that sold for $97 per lb.

Floor Coverings.

A covering for floors is now made in England, by gluing together a number of pieces of wood of different colors, and from this block thin veneers or slices are cut, which are then fixed by cement or glue to a woven cloth, or any other such material as may be preferred. Each veneer will have on it a pattern resulting from the arrangement of the pieces in the block from which it is cut, and by assembling a number of them together a complicated pattern is obtained; or when it is desired to have a simple pattern, the slices or veneers may each be cut from a single block; and it may be formed by arranging these pieces together. Various kinds of wood can be employed in this arrangement. A floor-cloth or covering thus prepared may be glued down to the floor which it is wished to cover, or, for temporary purposes, may be secured by nails. Also, this invention includes the use of veneer patterns nailed to any ordinary floor; such veneers of hard wood are reduced in thickness at their edges or corners, and are nailed to the floor beneath, the nails being covered by thin pieces of veneer, thinner than the others, and cut to a desired form, so that the whole makes an ornamental pattern. These pieces are, moreover, glued into their places, and the whole forms a flush and smooth surface.

Copying Copper-plate Engravings on Stone.

Lieutenant Hall of the Coast Survey states that copperplate engravings may be copied on stone; specimens are to appear in the forthcoming report. To quote his description: "A copperplate being duly engraved, it is inked, and an impression taken on transfer-paper. A good paper, which wetting does not expand, is needed, and a fatty coating is used in the process. The transfer-paper impression is laid on the smooth stone, and run through a press. It is then wetted, heated, and stripped off from the stone, leaving the ink and fat on its face. The heated fat is softly brushed away, leaving only the ink-lines. From this reversed impression on the stone, the printing is performed just as in ordinary lithography. A good transfer produces from 3,000 to 5,000 copies. Thus prints from a single copperplate can be infinitely multiplied, the printing being, moreover, much cheaper than copperplates.

Laminated Wooden Pipes.

We have lately examined at Mr. C. Lenzmann's office, No. 18 Dey street, New York, some specimens of Mayo's patent wooden pipes, having interior diameters of six inches and two feet. These pipes are composed of veneers, or thin sheets of wood, wound upon each other, cemented with bitumen, and lined with hydraulic cement. The samples we examined were about an inch in thickness, and, we were informed, had been tested by hydraulic pressure up to 310 lbs. per square inch without sign of fracture.

The improvement appears to be one of much value. The method of laying up the sheets in bitumen is calculated to render the material imperishable; and as the tubes can be made of any size, and furnished at much less rates than metal pipes, we see no reason why the invention should not come into extensive use for aqueducts, sewers, and other purposes.

MESSRS. WALSH & WATKINS, have laid a 11-inch plate iron water-pipe, from a point on a mountain side in Tuolumne county, California, down the mountain, under a creek and up the ascent on the other side, in all 8,800 feet in length, and under a perpendicular pressure at the lowest point of 684 feet.

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INTERNATIONAL TRIAL OF REAPING MACHINES.

An international trial of reaping machines, under the auspices of the Royal Hungarian Board of Agriculture and Trade, is projected by the Agricultural Society of the County of Wieselburg at Ungarisch-Altenburg, from the 5th to the 10th of July, 1869. The following rules have been adopted:

I. No other machines but reapers are admitted for trial and competition.

II. Reapers generally require a greater draft than that of two Hungarian horses, and for this very reason these machines have not, up to the present time, been in such general use as could have been wished; therefore, such competing machines will be preferred which do not require a greater draft than that of two middle-sized horses, their effect being of course in proportion.

III. The utmost simplicity consistent with durability in the construction of the machine is one of the first conditions for an award of a premium.

IV. Apart from all other qualities, a machine with self-delivery will be preferred, or a combined one to be also used for mowing grass. This said qualification is not, however, absolutely necessary in machines requiring but light draft.

V. All other qualifications being equal, preference will be given to those machines which will cut tangled or lodged grain, require least manual labor, scatter least corn, waste least straw, are the easiest to move, are lowest in price, and which deliver the straw in the most regular manner to admit of the sheaves being bound in the readiest way.

VI. Experience has proved that the Hungarian oxen, from endurance, strength, and swiftness, are well adapted for working reapers, the Agricultural Society therefore think it desirable that the speed of the knives of such machines which require more than 250 German pounds, should be modified to suit the pace of the native horses and oxen. The poles must also be arranged for oxen.

VIII. Premiums will be offered as follows:

First, for reapers constructed with self-delivery: 1st prize, 60 ducats and a gold medal. 2d prize, 40 ducats and a gold medal. 3d prize, a large silver medal.

Second, for reapers not constructed with self-delivery: 1st prize, 50 ducats and a gold medal. 2d prize, 30 ducats and a gold medal. 3d prize, a large silver medal.

VIII. The jury, which consists of Professors of the Royal Agricultural Academy, of Ungarisch-Altenburg, by approved deputies of the agricultural societies of Pest and Vienna, and representatives of agricultural societies of various countries, will pronounce its judgment on the reapers in a competent and strictly impartial manner.

IX. All other points not specially mentioned here, with regard to awarding the prizes, and the system of proceeding to be observed, will be arranged by the above jury.

X. Every competing reaper must cut no less than one Austrian acre (equal to about 7,000 square yards). Each competitor will have a suitable space allotted to him to experiment on previous to the trial. Horses or oxen for all trials are furnished by the Committee.

XI. No competing machine is allowed to withdraw before finishing the trial without the consent of the jury.

XII. The Agricultural Society, in inviting all native and foreign manufacturers of agricultural implements to send reapers, announce that the proper authorities will be requested to grant a reduction of freight and toll duties, the result of which request will be published as soon a possible.

The competing reapers are to be sent "Zur Ernte-maschinen-Concurrenz, in Ungarisch-Altenburg, letzte Eisenbahnstation Wieselburg, an der Wien-Neuszonyer Linie, Ungarn."

XIII. Manufacturers wishing to send reapers for this exhibition are requested to give notice before the 30th of June, to "Herrn R. Rath Paul Major, Vice-Präsident des landwirthschaftlichen Vereins Ungarisch-Altenburg," giving the number of reapers to be sent, stating whether self or hand delivery, the prices at factory, and if possible, the prices delivered both at Vienna and Pest, and further, whether a man will be sent to work the reapers or whether the society are to provide one.

The 30th of June is the latest day for the arrival of reapers at Ungarisch-Altenburg.

N. B.—The Committee will see that all due care is taken of the machines on arrival.

XIV. The Agricultural Society will also publish a precise report of the trial of the reapers, so that the result may be known both in Hungary and in foreign countries.

The Secretary of the above society is Charles Kopfmann, who may, we presume, be addressed by parties interested.

Smoky Chimneys.

The *Architect*, a London weekly, gives the following summary of the causes of smoky chimneys, condensed from a new work on the subject, published by Longmans, which seems certainly very comprehensive as well as concise.

"Want of sufficient hight in the flue. The outlet of the chimney being placed in an exposed and cold situation, while the air with which the fire is supplied is drawn from a warmer and more sheltered region. Excessive width in the flue, by which a large volume of cold air is drawn in and allowed to lower the temperature of the ascending column. Low temperature of the interior of the flue in comparison with that of of the external air. Humidity of the air. Too accurate fitting of the windows and doors, and joints of the flooring. The draft of one fire injuring that of others in the same house. A current caused by the heat of the fire circulating in the room. A flue of insufficient size. A foul flue. Displacement of masonry, or accumulation of mortar within the flue. The sudden obstruction of the draft by gusts of wind entering the chimney top. Increase of density of the air at the chimney top, due to the effect of wind in chimneys rising from the eaves of roofs. Drafts within the room which throw the smoke out of the influence of the ascending chimney current.

"Of course the remedies consist in the removal of these causes, but the suggestion given that the kitchen flue should be at the north or east end of a stack is sagacious; also, the recommendation to supply fire with air for its own consumption, drawn from the coldest side of the house. The arrangement proposed with this aim is ingenious, and no doubt capable of easy and effective application in a large proportion of cases; but the question of the exact position, size, and adjustment of the air inlet near the hearth appears to us yet open to further investigation; and it must not be forgotten that any such arrangement dimishes the efficiency of the open fire as a ventilator of the room."

FARMER'S HAND DUMPING BARROW.

The object of the device, of which the accompanying engravings are representations, is to furnish a hand barrow, superior to those generally in use, for mines, coal yards, railroad stations, gas works, founderies, farms, etc. It is capable of turning very short corners, under perfect control, readily handled by one man, cannot be overturned by accident, and dumps its load easily. It has an additional advantage over the ordinary barrow in being shorter by the diameter of the wheel and the length of the barrow handles.

Fig. 1.

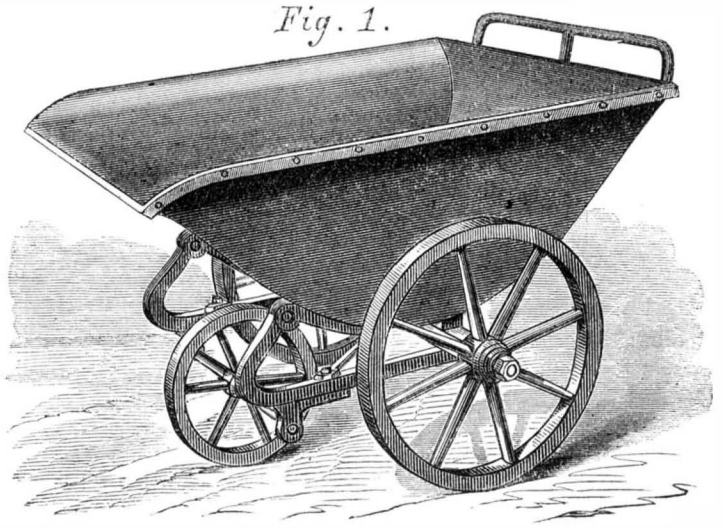
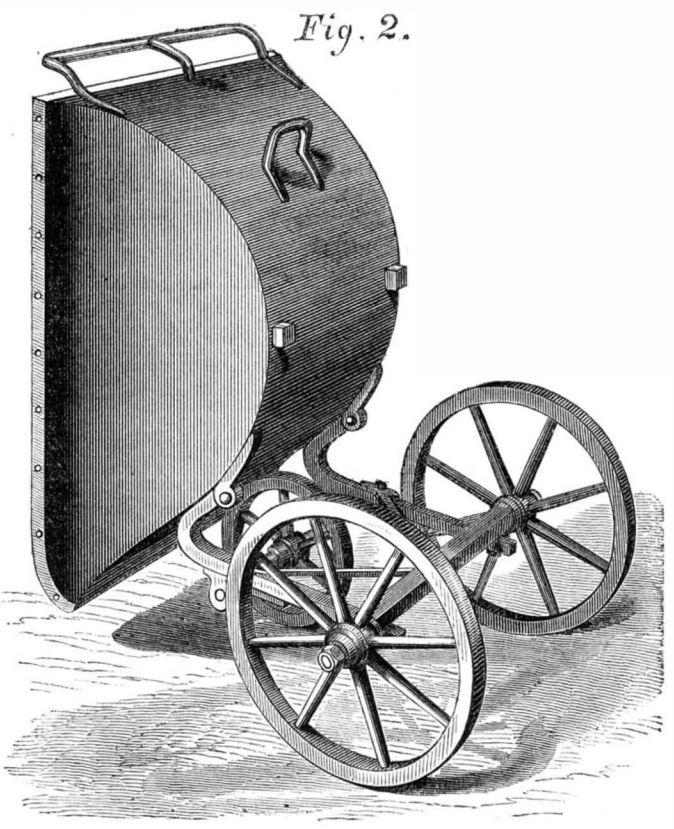


Fig. 1 is the cart in position for receiving its load; Fig. 2 is the cart reversed for delivery. When loaded the weight is borne almost wholly by the axle which carries the two large wheels. The pivots on which the cart body turns in the act of dumping are directly over the small leading wheel which then receives the weight. The load may be so adjusted that but a slight effort will be required to tilt it either way, to raise the front wheel in turning short corners—done by bearing down on the handle at the rear—or to deliver the load by lifting lightly on the handle. These barrows may be seen in use at the works of the Manhattan Gas Light Company, 18th street station, North River, and 14th street station, East River, New York city.

Fig. 2.



Patented through the Scientific American Patent Agency, March 16, 1869, by Wm. Farmer. For State and county rights, or further information, address Herring & Floyd, 740 Greenwich street, New York, or the patentee at the Manhattan Gas Works, 18th street, North River station, New York city.

Sea Tunnels.

Under-sea tunnels are attracting the attention of English engineers. In addition to the projected tunnel under the English Channel, between Dover and Calais, it is now proposed to unite Scotland and Ireland by a tunnel, running from a point on the north-east coast of Antrim, Ireland, to Glenstrone, Scotland, passing through the high rocky peninsula called the Mull of Cantyre. The total length of the tunnel is estimated at fourteen miles three furlongs. The ground through which it would have to be dug, it is asserted, is exactly suited for tunnelling operations, and the sandstone for lining it can be had in any quantity on the Irish side. It is proposed to construct the tunnel for a single line only, the extreme depth being twenty-one feet, and the clear width at the level of the rails fifteen feet. Three lines of rails, to accommodate wide and narrow gage carriages, however, are to be laid. The time estimated for completing the tunnel is about six years, and the cost $21,250,000. To pay a dividend of five per cent, the road should earn $210 per mile per week.

Transmission of Power by Hydraulic Pressure.

Sir William Armstrong, in a paper read before the Institution of Mechanical Engineers in England, states that he considered water in a pipe is preferable for many purposes to shafting, as it is perfectly controllable, and, being uniform in its action, communicates no shocks to the machinery. At present there about six thousand hydraulic machines in use in England, and it is in docks and establishments where there is much lifting, and loading and unloading to be done, that their use may best be seen. Twenty or more cranes may be working at once, unaffected by each other. At the docks at Goole, on the Humber, these hydraulic cranes lift barges containing thirty-two tuns of coal fairly out of the water, to a considerable hight, where they are made to tip their load all at once into a coal-ship lying alongside. Another use for hydraulic machinery is to feed blast-furnaces. These furnaces are now built so big and tall, that the labor of wheeling up the ore and fuel to the mouth would be too severe and costly. The hydraulic lift, when properly arranged, does it by the turning of a cock. By the same simple operation, large holes can be punched through thick solid iron. At Newcastle-on-Tyne, the water-supply, as it runs down one of the hill streets, flows through an engine, and prints a newspaper. In other parts of the same country, all the raising and lowering in the mines is done by water-power.

Process for Rendering Casks Impervious.

The *Chemist and Druggist* states that important result, which has long been aimed at, seems to have been most satisfactorily accomplished by the use of paraffine. Although introduced to the various trades interested only within the past month or two, a long course of experiments has been instituted, for the purpose of fully testing the efficiency of paraffine in rendering casks, vats, and, indeed, wooden vessels of every description, thoroughly impervious to air and moisture.

The result of the investigation has been to establish fully the value of the process, which, we have no doubt, will shortly be generally adopted by brewers, wine-merchants, vinegar-makers, and others; while exporters, dealers, and consumers will all welcome a more perfect preservation of those liquids which are liable to fermentation, or become insipid by exposure to atmospheric influence. Many attempts have been made to secure these ends by means of soluble silicates, varnishes, etc., applied to the casks; but, from many causes, these have been, at best, but very partially successful. Paraffine, as most of our readers are aware, is a substance much resembling spermaceti in appearance, and possesses every requisite to fit it for the purpose required, while it also seems to be entirely free from all properties which would interfere with its service in this respect. The experiments which have been made with this substance in the preservation of meat, indicate its perfect power of preventing all contact of air, while its insolubility in water or spirit, its absence of taste and smell, and its freedom from all liability of cracking, give to paraffine a combination of advantages which can hardly be surpassed for the objects we now refer to. Paraffined casks, while retaining the safety and economy of wooden vessels, are in all respects of cleanliness and non-absorption, equal to glass. They wear longer, are much more readily cleansed, and preserve their contents in better condition than casks not so treated, and thus effect a considerable saving to firms who make use of them. We regard the process as one of considerable practical utility, as well as generally interesting.

Descent of Glaciers.

The Rev. Canon Mosely, in a paper published in the proceedings of the Royal Society, comes to the conclusion, from mathematical calculation, that the weight of a glacier, together with the weight of any snow mass behind it, would not account for its peculiar descending motion at the slopes which are observed. The glacier moves not as a whole, but with different velocities in different parts. "It moves faster at its surface than deeper down, and at the centre of its surface than at the edges." Thus it suffers constant disruption, and the parts are reunited by regelation, as Faraday explained. The displacement of particles one over the other in this motion is known in mechanics as *shearing*, and Mr. Mosely shows that the resistance to this movement is so great that the weight of the mass could not account for its descent; and that some other force much greater, and producing internal molecular displacements, must come into play.

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BEET ROOT SUGAR.

No. V.

TECHNOLOGY.—PART II.

THE PRESS ROOM.

Before proceeding with the description of the treatment of the beet root juice after it has left the hydraulic presses, we shall dwell for a few minutes upon some very important, although apparently trivial details, which, for the sake of clearness only, we omitted in our previous article.

Work in a beet root sugar factory being continuous through the day and night, without interruption, it is essential that at least twice during every twenty-four hours, the whole of the press room, with all that portion of the included apparatus which comes into immediate contact with the juice, should be most *thoroughly* cleaned and purified. This is best done at midday and at midnight, when a stoppage of half an hour will generally suffice.

The material used for this purpose is water in large quantity, to which a small amount of slaked lime has been added in order to render it alkaline. Not only must the whole of the stone or marble floor of the press room be thus thoroughly scoured with hard brooms, but also the press tables and their guides, the *monte-jus*, the reservoir for juice, and all other utensils.

The sheet-iron trays must also be scrubbed with a hard brush in hot lime water, in an iron tank, at least twice a week.

The above precautions are absolutely necessary in order to prevent the occurrence of fermentation of the juice, one of the accidents most to be dreaded during the whole process of manufacturing sugar from beets. When once fermentation has taken a foothold in the works, it is generally found to maintain itself there with aggravating persistency, being constantly propagated anew, through minute particles of ferment, remaining in nooks and corners, where they can hardly be destroyed by any amount of labor. Instances are on record where the manufacture of sugar has had to be interrupted for whole weeks from this cause alone.

Cold weather being unfavorable to fermentation, it seldom proves troublesome during the winter, but without necessary precautions, it is certain to be of frequent occurrence during autumn and spring, when the temperature is higher. This same cause precludes the possibility of *profitably* manufacturing beet root sugar during the summer months, which would otherwise be practicable in our Southern States, where two crops of beets can be raised during the year. For the same reason also, the press room must never be artificially heated to over 60° Fah., which will be sufficient to keep the workmen comfortably warm if they wear, as they should, winter clothing and water-tight boots.

In some localities in Europe, where labor is cheap, the pulp is pressed a second time in hempen sacks, after having been sprinkled with water, but in the United States, we believe that it will prove more profitable to lose 1, or even 2 per cent of sugar (which will be transformed into fat in the animals fed on the refuse pulp) than to incur the expense of this second pressing.

Beet root pulp will keep for months in trenches, which are best lined with brickwork, the pulp being compressed into them by means of a rammer, and then covered with straw and a thick coat of earth. It undergoes a partial fermentation after a period of a few weeks, which only tends to make it more palatable to farm stock.

It is fed to cattle, sheep, etc., mixed in various proportions with bran, cut straw, wheat chaff, meal, oilcake, or some other nutritious substance. In order to prevent long-continued use from rendering it distasteful to the animals, it is generally found advantageous to slightly salt it by sprinkling with salt and water at the time of serving it.

Some of the mixtures which are considered the best for the feeding of live stock in Europe, are the following, every twenty-four hours

For fattening an ox: 50 lbs. well pressed pulp, 12 lbs. hay, 3 lbs. oil cake.

For fattening a wether: 8 lbs. pressed pulp, ½ lb. dry fodder.

For feeding a ewe: 2½ lbs. pressed pulp, ½ lb. of dry fodder.

The proportions of these mixtures may, however, be varied by intelligent raisers of domestic animals so as to suit their exigencies.

THE WOOLEN SACKS.

The pulp sacks have to be made of a lax, wide-meshed tissue, the wool having to be twisted and coarse. The part of the fleece generally considered of lowest value for weaving into cloth, is, for our particular purpose, the best, as it is cheapest, most durable, and not so liable to shrinkage, as is wool of fine quality.

The sacks must be washed as often as they become soiled or "greasy." This is done by means of a *sack-washing machine* driven by power, of which many kinds are in use, the simplest of which is a revolving gridiron cylinder, with a central rotating arm-bearing axle.

The water used in all cases must be boiling hot, and contain a certain amount of lime (milk of lime), potash, or soda, in order to detach all fatty or slimy adherent particles. The ammonical waters from the evaporating apparatus may also be advantageously employed for this washing of sacks.

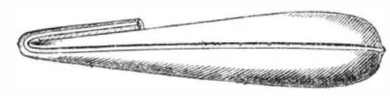
Immediately after leaving the washing machine, the sacks are to be rinsed in clear cold water.

In ordinary winter weather a set of sacks in actual service, will need only one washing and rinsing every six hours, but if any appearances of fermentation are manifest in the press room, or if the temperature of the air be high, they will need more frequent manipulation.

After the rinsing, the sacks are hung up to drip and dry, or the water is pressed out of them by placing them in sets of from five to ten between sheet-iron trays under a hydraulic press.

If the washing and rinsing have been properly performed, the sacks will have no peculiar odor, and will not feel slimy to the touch.

In order to protect the sacks and save the pulp during the operation of pressing, it is necessary to fold them the length of their anterior quarter; thus:



After this, the thickness of the pulp must be equalized by means of four or five strokes given with a short wooden roller. The sacks are laid on the trays with the folded part upward. Practiced workmen spread the pulp with the hand without a roller.

The folding and equalizing of the pulp are effected on a small, but heavy side table provided for this special purpose and placed near the presses.

It is important that the sacks should be well shaken out when the pulp is dropped out of them, and that no pulp be left lurking in the lower corners, to effect which it is best to turn them inside out every time they are washed.

The sacks used for the scums (of which we shall have more to say in a future article) are washed, and rinsed in the same manner as the pulp sacks, *at least* twice in twenty-four hours. It is better to do it thrice than twice.

This item, "sacks," is one of considerable importance, as may be judged from the fact, that a factory working 150,000 pounds of beets per day, will send to the washing machine no less than 900 to 1,000 sacks every six hours. Each of these sacks has to be overhauled after rinsing, and the torn or injured ones sent to the *darning room*, where a number of operatives are kept constantly employed repairing damages.

Even with the greatest care taken to keep the pulping drum in right order, and also to seeing that the presses do not rise too fast, the wear and tear in sacks during a campaign are always such as must be taken into account in all calculations of cost of production of beet root sugar.

The price of sacks varies in Europe from 50 to 75 cents, so that we may estimate the first cost of a full set of them, for a 500-acre factory, at no less than $2,000.

The sheet-iron trays are about one line in thickness, and are made 1½ inches broader than the intercalated sacks, so as to avoid protrusion of these last during the operation of pressing out the juice. The angles of these trays must be rounded off, so as to avoid injury to those who have to handle them. About 4,000 trays suffice for an establishment such as we have taken for an example, and would cost $1,000.

The price of a good sack-washing machine and connections is $110.

Total, in gold, for sacks, trays, and washing machine, $3,110.

DEFECATION OF THE JUICE.

After the beet root has been washed, pulped, and submitted to the action of the hydraulic presses (or to that of any other method of juice extraction), the liquid product is, as we have previously stated, collected in a special reservoir.

If the beet root juice consisted simply in sugar and water, the further processes of manufacture would be simple in the extreme, as boiling down or concentration would give us, in one operation, crystallizable sugar; but, as we have shown in Art. II., the sap of the beet root exhibits a long array of contained soluble substances and impurities, all of which have to be eliminated during the subsequent treatment of the juice, necessitating the aid of chemical science in addition to the use of mechanical means.

The various substances to be removed from the beet root juice may practically be divided into two classes; first, those which can be removed before crystallization of the sugar; and second, those which cannot.

The first class of these bodies is, by our modern processes, in a great measure eliminated by the combined action of heat and the use of lime, the operation being known as the "*defecation*" of the juice. During defecation, a certain portion of the sugar combines with some of the lime used, forming a particular body—the *saccharate of lime*. From this saccharate of lime the sugar has to be freed again in order not to be lost by the action of carbonic acid gas, which, having a greater affinity for the lime, combines with it, forming insoluble carbonate of lime, while it liberates the combined sugar, which is then ready for further treatment. This last process is called the "*carbonatation*" of the juice.

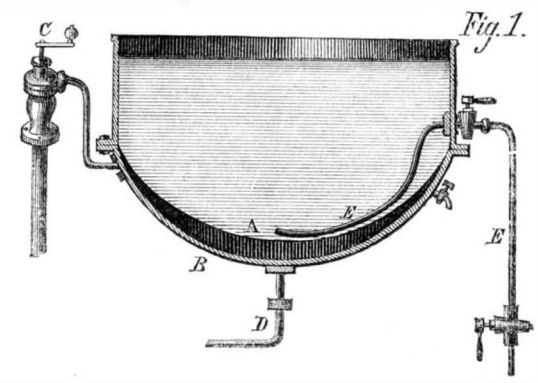
We shall now proceed to exhibit in as practical a manner as we can, the ordinary, most simple, and most generally practiced processes of defecation and of carbonatation, and shall follow them, by a summary of the more recent improvements proposed by Perier-Possoz and by Jelinek, the first of these, consisting in a series of successive defecations and carbonatations, and the second in making both of these operations simultaneous.

Defecation is operated in a batch of open circular, round-bottomed pans, known as defecating pans, of which Fig. 1 is a section.

A is the bottom of the pan. B is an outer steam-tight jacket, or false bottom. C is a steam valve through which steam is admitted, between A and B, in quantities to suit the exigencies of the moment. D is the outlet for condensed water and superfluous steam which is returned to the "return boilers." The small cock, shown in the cut, on the right of the false bottom, is for regulating the egress and ingress of air between the double bottom and also for favoring the complete evacuation of the steam. E E is a syphon tube, furnished with necessary cocks and stops, through which the clear juice is drawn off after being defecated.

In many factories, instead of this tube, E E, an orifice closed by a wide-mouthed cock at the bottom of the pans, and opening into a wide funnel, is preferred. Through this funnel the clear juice is at first run off, and is followed by the scums formed during defecation, each of these products being

Fig. 1.



conveyed to different departments of the works to be further separately treated. These latter pans are easier cleaned than the first, but the syphon pans furnish a larger amount of clear juice.

The capacity of defecating pans varies according to the quantity of juice worked up in twenty-four hours, but seldom exceeds five or six for the largest works. While defecation is proceeding in some of the pans, others are being cleaned or being filled or emptied in regular methodical order and sequence.

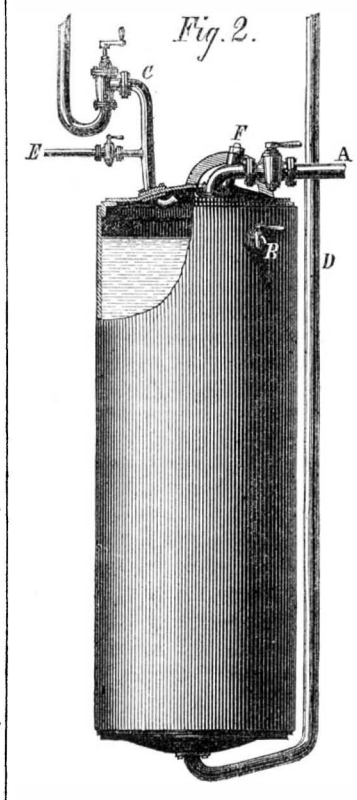
The defecating pans being placed on a higher floor than that of the press room (so as to be above the head of the filters), the juice has to be raised from the lower reservoir to the upper edge of the defecating pans, over which it is discharged through special pipes.

The old plan of pumping up the juice has been replaced in all modern sugar works by the cleanly, simple, and rapid process of steam pressure applied directly to the upper surface of the juice contained in a closed vessel. This is done in an iron boiler, the liquor being conveyed at regular stated intervals of time from the juice reservoir to this boiler, and from the boiler to the defecating pans.

This upright boiler is called a *monte-jus* (literally, mount juice). As quite a number of *monte-jus* are used in all beet root sugar factories, during subsequent operations as well as the present one, we will here give a general description of a *monte-jus*, which will apply to all.

A *monte-jus* must be constructed of strong boiler plate, well riveted, and be sunk into the ground into a cylindrical well-drained brick cistern (the brick work of which must be joined with hydraulic cement, so as to keep out water, and be situated at some little distance from contact with the boiler). The top of the *monte-jus* alone is allowed to project above the floor of the building.

Fig. 2.



In our Fig. 2, A is the pipe through which the juice is admitted from the reservoir of the presses into the *monte-jus;* B is a small cock for ingress and egress of air and evacuation of steam; C is the pipe for admitting steam, its orifice being bent upward so as to cause the entering steam to strike the inner surface of the boiler head; E is the pipe for conveying the return steam to the boilers; F is the manhole door for cleaning out the *monte jus;* D is the pipe through which the liquid is forced from the *monte-jus* to the level above, the moment steam is admitted through C, when E and B must be closed.

Every indicated pressure of one atmosphere, or 14·7 lbs., will rapidly raise the juice through a hight of 30 feet.

Monte-jus are often furnished with a steam gage, safety valve, and a float, indicating the hight of the contained liquid.

As soon as a defecating pan has been filled from the *monte-jus* with raw juice to nine-tenths of its capacity, steam is admitted between the double bottom by opening the valve C (Fig. 1) to its utmost extent. The juice is rapidly heated until it reaches temperature of from 174° to 185° Fah., a fact which practiced workmen appreciate without a thermometer by merely dipping their fingers into it, and by the aspect of the numerous minute particles of coagulated albumen which are present in it. This temperature is just bearable to the hands without scalding.

At this moment, milk of lime, prepared from very pure lime, is poured into the warm juice, and well stirred into it.

Steam is allowed to continue entering the space between

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the double bottom with full force, until a layer of scum of the thickness of a finger has formed on the surface of the juice, when the valve must be closed little by little, but in such a gradual manner that just as ebullition declares itself in the liquid the steam must have been cut off to one-quarter of its original quantity. This last portion of steam is itself to be suddenly suppressed, as soon as ebullition and consequent termination of defecation indicated by a sudden irruption of clear juice on the upper surface of the scums, have manifested themselves. The defecating operator must always be a man of experience, as much is left to his empirical judgment.

The signs by which a favorably-progressing defecation are known, are as follows:

1. The scums must gradually form at the surface of the juice, in large flakes of a greenish-brown color.

2. These flakes must unite into a thick layer in which large crevices form, through which the limpid juice below is discernible.

If the scums are of a yellow color and look thin, or if ebullition takes place at too early a period, some unnatural alteration in the juice must have taken place, either through heating or putrefaction consequent on the thawing of the beet root, or through the action of fermentation brought on by impure water left in the reservoir or in the *monte-jus*, or lastly, by the use of imperfectly worked sacks.

In our next article, we shall give an account of the mode of preparing the milk of lime used in defecation, and the manner of "dosing" it to the juice. We shall also attempt to give a general idea of the *rationale* of defecation, and proceed to explain the necessity for carbonatation and the mode of effecting it.

The estimate and valuation in gold for the defecating department of a factory for working 150,000 lbs. of beet root every twenty-four hours, is as follows:

Three copper defecating pans, with cast-iron false bottoms, with all their special fixtures, cocks, valves, etc., same capacity as *monte-jus*. Cost, $1,320.

Copper feed pipe, with three cocks for juice, and iron pipe with three cocks for water for washing out pans. Cost, $100.

Total, for a defecating department of a 500-acre factory, $1,420.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

The Singing Mouse.

Messrs. Editors:—It was in the summer of 1867, when I was seated near where the casing of the water pipes passed up through a closet, that I heard what I supposed to be the twittering of a brood of chimney birds within the casing. Some days afterward the cook reported that there was a large nest of mice in a box of fuel near the range in the kitchen. We were at dinner, and I passed out to capture and kill the pests Listening to the sounds, I again pronounced it a brood of birds that must have fallen down with their nest from an adjoining chimney, as the sounds were not those of mice. Removing everything, I found that the sounds did not proceed from the box, but were behind the woodwork of the wall near the floor. Nor did the music, as I may call it, cease when I made several hard raps upon the woodwork. This convinced me that the sounds had their origin at a distance, and were conveyed to that point as through a tube. That evening, when I passed round to see if all the house had been safely closed, the music appeared to be in a different locality, and as all was still, I studied attentively the character of the sounds, and became convinced they were not produced by birds.

On my making a disturbance it ceased. Thus the music continued for two or three days, when one evening I heard it in the china closet of the dining-room, apparently behind a tray on the shelf. But in removing some plates to investigate the matter, the shuffling frightened a mouse, which made good its escape away from the tray and ran into a hole at the corner of one of the shelves. The music then ceased. This was not positive proof that the mouse was the performer in the singing. On the next night I heard the music again in the same place, and having previously adjusted the dishes to suit me, I supposed I would easily capture the musician; but the cook had re-adjusted the dishes, and in shifting them a mouse had again run away, and the music ceased as before; fortunately, however, this time the music was resumed in the place into which it had retreated, affording ample evidence that that the mouse was the author of the music.

The mice being annoying, the cook, next day, introduced a cat into the cellar, and, on the following night, the mouse had retreated up the chimney flues to our bed-room, on the second floor above the dining-room.

About two o'clock A. M., on awaking, I heard the music distinctly proceeding from the hearth beneath the grate. It was loud enough to be heard throughout our large bed-room. My wife, who had been ill and unable to go down to the dining-room, had doubted our reports; but when I awakened her, she sat up for more than an hour, completely fascinated by the little songster.

On the next night a suitable trap was set and the mouse was captured without injury, but unfortunately, it escaped while we attempted to remove it to better lodging. One very peculiar trait in its character was, that it continued to sing during the whole time it was a prisoner.

On the next night it was again captured and safely disposed of in a secure cage with a wheel.

The cook reported another singing mouse in the kitchen, and a new and elegant cage was procured for our little captive. Its musical notes were identical, as near as we could judge, with the warbling notes of the canary bird. At times, only a single note would be sounded, and after a pause the performer would dash off its warbling notes for hours—even for nearly half a day. Then it would cease and rest, sleeping, perhaps, as it retired to its bed.

This cessation of singing for hours, proved that its performances were not *involuntary*, from a diseased condition of the throat, as has been conjectured in other similar cases, because it could sing and cease from its music at will.

In the wheel of its cage the singing was somewhat interrupted by its efforts, and was not so perfect as when the mouse was in the cage itself. When it appeared to become fatigued with the effort of turning the wheel, sympathy was enlisted in its behalf and the wheel was tied so as not to revolve. This was a fatal mistake, as the mouse then began to nibble at the wires of the wheel in trying to escape. The wires had been painted with white lead, and the mouse was poisoned, and died, to the great grief of the family. It now stands in the parlor, under a glass globe, being neatly set up by a taxidermist.

David Christy.

New York city.

Testing Boilers.

Messrs. Editors:—Justice to a class of men known as inspectors of boilers, selected for their acknowledged skill and experience in practical engineering, imperatively demands an answer to your correspondent "J. H. L.," with a view to refuting his arguments on page 182, current volume. As he does not hurl his thunder against any particular division of boilers, I take it for granted that steamboat boilers are meant also.

First, his statement that boilers are subjected to a hydraulic (hydrostatic) test of two hundred pounds, and allowed a steam pressure of eighty pounds, is incorrect, as a simple reference to the steamboat law will show; for the proportion there established is as 165 is to 110; or plainer, the hydrostatic exceeds the steam pressure by one-half; whereas two hundred pounds exceeds eighty pounds two and a half times. I fully concur with him in that this excessive pressure would greatly weaken the boiler, if it were applied, but happily such is not the case. Second, the temporizing, of which he so loudly complains, may be a distinguishing feature of his locality, but in most, if not all, of the ports of inspection it has no being. Lastly, the condemnation that he pronounces upon the test, serves but to show his unacquaintance with its history; for the large reduction in disasters from this cause amply proves the correctness of the theory. And the method of examining the boilers internally and externally is not original with him, and is practiced by inspectors after the test. I can assure the gentleman that nothing can make up the deficiency or carelessness of the engineer, whether it is attempted in the shape of laws or safety appliances to the boilers. Let an employer secure the services of an attentive, skillful engineer, and, my word for it, all will be well, and nothing will be heard of incompetent inspectors and excessive tests.

James Butler.

New Orleans, La.

[We do not see how the temperate communication of J. H. L. should arouse so harsh a spirit in Mr. Butler. J. H. L.'s article appears to be merely suggestive and advisory, and in no sense arbitrary or combative. The facts he stated are too well established by experience and observation to be overthrown by the style of attack chosen by Mr. Butler.—Eds.

The Law of Steam.

Messrs. Editors:—The formulæ for determining the latent heat of steam from the temperature indicated by the thermometer, given incidentally by me in my article on the "Law of Steam," published in the last issue of the Scientific American, and which I took from John Sewell's well-known treatise on "Steam and Locomotion," are incorrect, and as such, liable to lead persons who are not familiar with the theory of latent heat into error.

I take this first opportunity of putting the matter right by furnishing the true formulæ as they should have been stated.

To find the units of latent heat in steam when the thermometric indications are known, use the following:

For the Centigrade scale, $T \cdot 305 + 606 \cdot 5 - T = L$.

" Fahrenheit " $(T-32) \cdot 305 + 1123 \cdot 7 - (T-32) = L$.

In both of which T is the observed temperature of the steam, and L the latent heat.

The number of 17 Centigrade units, which I have given as the *approximate* difference between two terms of the arithmetical progression of my law of steam, being supposed correct, the corresponding figure for the Fahrenheit scale ought to be $17 \times 1 \cdot 8$ or 30·6 Fahrenheit units.

I find, after a careful comparison of the mean pressures and corresponding temperatures *observed* by the Franklin Institute Committee, that the result of their numerous experiments indicates a general average of 30·7 Fah. units, showing as highly satisfactory accordance between the deductions of my theory and their practical results, as I had previously found to exist in regard to the experiments of the French Academy and of Regnault.

J. M. Deby.

A Challenge to Watchmakers.

Messrs. Editors:—My second challenge to watchmakers is founded on simple, well-known facts, clearly explained in the following:

First, correct poise requires the balance to be poised in its place in the escapement. Second, vibrations of variable extent, in equal motive force, cannot keep their rate unless they are isochronal. Third, equal extent in the vibrations is impracticable in contrary positions of the watch. Fourth, opposite positions must be used in the process of poising balances.

This challenge is intended for all pocket chronometer makers, to the effect that they cannot poise their balances properly, unless they have friction isochronism in the escapement ("isochronal hairsprings" or not), for two reasons: one is the variable resistance to the motion of the balance, in the opposite positions of the movements while testing its equilibrium; the other reason is the variable impulse in equal motive force, such as results more or less from imperfect unlocking in a different position, striking the pallet upward, etc.

As a general thing, all causes (variable and capricious frictions, and variable impulse to the balance) of change in motion, in which the mainspring has no part, have the same effect as altered friction, and like the latter, come under the control of friction-isochronism.

The balance may be exactly poised to suit the circumstances of a case, but as soon as these foreign influences change (neutralize each other, or act in concert), the balance will show defective poise. It is therefore explained that the resistance and impulse effects must be isochronalized before the poise process can be begun.

J. Muma.

Hanover, Pa.

Finish of Paper Collars.

Messrs. Editors:—Some time since you noticed the receipt of a linen-finish paper collar that had been blackened by sulphureted hydrogen. You said that should not be taken as a conclusive test of the presence of lead, but other tests should be applied. I inclose a cuff on which I placed a drop of solution of bichromate of potassa, which appears to indicate the presence of lead by the formation of chrome yellow, as is shown by the contrast between that and the pale yellow spot caused by the bichromate on the "unfinished" side. A piece of the "finished" surface also gave a yellow incrustation when heated on charcoal before the blow pipe, but failed to do so when heated in the same manner with carbonate of soda.

Charlotte, Maine. H. A. Sprague.

[There is no doubt that the specimen inclosed by our correspondent contains lead.—Eds.

A Valued Testimonial.

Messrs. Munn & Co.:—In token of my appreciation of your valuable services to my house, as a reliable medium to procure patents, I feel it not only a pleasure, but a duty due to you, to say that within the past four months I have made application for nine patents through your office, and in every case you have been successful. The fidelity and honesty with which you have treated my business, together with the gentlemanly courtesy which I have received, not only from the heads of your house but from all your large staff of employés, in your New York as well in your branch office in Washington, constrain me to send you this. The character of your business is too well established to require any further testimony, but if this can be of any use, I shall be pleased. With my best wishes, Yours respectfully,

Charles Pratt.

108 Fulton street, New York, March 26, 1869.

[The above is from of one of the largest dealers in, and canners of oil in the country, and the patents referred to pertain solely to his business. Mr. Pratt's facilities for transacting business are such that he can make 10,000 cans, and fill, seal, and ship 50,000 gallons of oil per day. The value of the solder consumed in this concern amounts to $20,000 annually. Every kind of oil is dealt in by Mr. Pratt, and any package, whether illuminating or lubricating oil, bearing his trademark, can be relied upon as being all it is represented to be. His advertisement may always be seen in our columns, to which the reader is referred for further information.—Eds.

For the Scientific American.

GRAVITATION THE ORIGIN OF THE HEAT OF THE SUN

Having traced back in a former article (page 198) the source of all motion and of all life on our planet to be the heat of the sun, the answer to the question as to the source of this heat, becomes of still greater importance than it has ever been. Considered from this point of view the solar heat is an enormous motive power, stored up when the solar orb was formed, by the very act of its formation, and now this power is gradually returning into space, carried forward by the radiation of the sun's rays; here and there this power reappears in the form of motion, on the surface of some planet where the conditions to this transformation are favorable.

I attempted in the former article to point out that, as chemistry has taught how matter shows itself to us under the most varied forms, and undergoes the most surprising transformations in its properties, even so the modern investigations in regard to force have proved that, being nothing but matter in motion, force will show itself also under different forms, and also undergo astonishing transformations, from motion of masses to molecular motion, the last of which may be vibratory, rotatory, etc., and produce the phenomena of heat, elasticity, etc.

It has also been proved that just as matter is indestructible, so that not an atom can be created or destroyed by man, even so force (matter in motion) is indestructible, and that not the least trace of force can be created or destroyed by man; and like as the universe contains a certain measured amount of matter, so also it contains a certain measured amount of force, which means that even as the sum total of all matter is a constant quantity, so also the sum total of all force or motion is a constant quantity.

I wish now to point out how a modification of the nebular hypothesis of Laplace will explain consistently the origin of

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the sun's heat, in accordance to the present state of our knowledge in regard to the relation between heat and force, and the convertibility of one into the other.

Laplace supposed that all matter in the universe was once in a state of vapor, or was a nebula, and that by cooling it had contracted, and thus by further contraction formed the sun, stars, planetary systems, etc. This hypothesis presupposes the previous existence of an enormous high temperature, as well as the existence of the matter, the loss of the heat by radiation, the contraction subsequent on cooling, etc. When we, however, accept nothing but the existence of matter and of gravitation urging this matter to coalesce in diverse common centers of attraction, and apply to this supposition our present knowledge of the change of apparently destroyed motion into caloric, Laplace's hypothesis is at once elevated into a theory, and we may accept that when matter, at first diffused in the universe, and, urged by gravitation, commenced to coalesce in different centers of attraction, and had there this motion destroyed by opposing forces (viz., matter falling in opposite directions), the visible motion of the masses had necessarily to be changed into molecular motion, viz., heat.

When now we take in consideration the enormous amount of matter falling together, and the almost immeasurable distances through which it fell, and apply to it the rule proved by modern mechanics, that the falling of 760 pounds 1 foot, or 1 pound 760 feet, will produce one unit of heat, the number of units of heat produced at the formation of sun and planets must have been so immense that it takes thousands of millions of years to cool such large masses, raised to so high temperatures, by radiation, a process which has been going on in the planets, as is proved in regard to our earth by geology, and as also is going on at present, as we know in regard to our sun by daily experience.

The old hypothesis of Herschel, still also copied in some of our school books, that the sun is a dark, cold, solid body, surrounded by a luminous atmosphere, is utterly disproved by the investigations by means of the most valuable inventions of our decade—the spectroscope. Indeed, this instrument has not only proved that the sun possesses a high temperature, but also that this high temperature is not the result of a permanent combustion, like the high temperature on our earth (excepting volcanic fires), and also that this temperature is so high that most substances solid on our earth are surrounding the globe of the sun as an atmosphere in the state of vapor, as some of our metals, iron, nickel, sodium, etc.

The ideas here presented were fully developed by the writer three years ago, before the American Institute, New York City, in a series of three lectures on the universe, its past history, present condition, and its probable final fate, which lectures are found in the Transactions of the Institute for 1866.

If, then, the law of gravitation is the sole source of the sun's heat, and also of our ocean tides, and the sun's heat the cause of all motion on our planet, we must come to the conclusion that the simple and single law of gravitation once acting mutually between particles of matter dispersed in space, is the primary cause of all other forces, and that all the complex actions of life and other motions on the surface of our earth, being traceable back to the simple law, are only gravitation in disguise.

P. H. VANDER WEYDE, M. D.

Causes of Steam Boiler Explosions.

It is certain that any information as to the circumstances of steam boiler explosions, even if it does not give the causes, is valuable. We copy a few remarks from the fourteenth half-yearly report of the Chief Engineer of the Midland (Eng.) Steam Boiler Inspection and Assurance Company, which may be of real use.

"At the end of the year 1868, 1,103 boilers were under inspection, and 1,530 under assurance, making a total of 2,633. These boilers were used for the following purposes: 1,238 in collieries, 1,156 in ironworks, and 239 in mills of various kinds. The boilers were of the following general description: 2,205 fired externally, and 428 fired internally.

"During the year, there have been made 11,900 inspections of boilers, 1,483 of which have been internal, and 1,361 in the flues, and 1,656 reports have been sent to the owners. The following brief epitome of the chief points referred to in these reports may be of general interest:

"The point of first consideration is the general construction or repair of the boilers, and the arrangement of the flues. Many boilers have been taken out as not being fit for the required pressure. Some or these have been discarded because the plates were arranged lengthways in the boilers, producing in the weakest position, long, straight seams without any crossing of joints. In some cases this weakness has been increased, by the inside lap of each plate being so small, that the rivet holes were almost at the edge of the plates. The flat ends of boilers have been frequently found insufficiently stayed, especially were tubes have been removed, and it has been at times difficult to convince owners of the danger of this, although the ends have been shown to be bulged from weakness. Some few machine-made boilers have been found quite unfit for use, simply because the work was inaccurately done. There is no question, boilers can be well made by machinery, but if the work is placed carelessly, so that the plates do not meet, or the rivets are not struck fairly, the boiler cannot be made sound. Boilers are constantly noticed needlessly weakened in order to obtain the doubtful benefit of a dome, especially where the hole in the shell is its full diameter. One small boiler (9 ft. 6 in. by 3 ft. 6 in.—30 lbs.) was pierced with so many holes for fittings in one line on the top, that more than one-half the strength of the shell was lost.

"Boilers of good design and safe proportions are frequently made insecure by injudicious alterations. Tubes are taken out without any compensation for the loss of strength, and stays or tie-bolts are allowed to get slack. This has been more particularly noticed in upright furnace boilers, where new bottoms have been made nearly flat instead of hemispherical, causing a new strain on the angle iron and on the old work. In a somewhat similar way, mischief is often done by altering the arrangements of the puddling furnaces, or by substituting large mill furnaces, so that the boiler is exposed to more heat than the metal can transmit, or the water convey away in the shape of steam, and the plates become injured. Sometimes the exact contrary is done, and a furnace is discontinued, and half a boiler is exposed to cold air, while the other is furiously heated, causing a new and unequal strain.

"Sometimes internal tubes have been found forced out of the circular shape, for want of strengthening rings or other means of security. Manholes have been found in a dangerous state from want of guard rings, the edges of the plates having perished or cracked, rendering it impossible to make a good joint, and the continual leaking has made the matter worse. Serious complaint has had to be made of some of the workmanship in repairs, by which boilers have been nearly ruined.

"Corrosion has as usual proved a serious evil. Suspicion was entertained that corrosion existed on the side of a plain cylinder boiler (22 by 5—16 lbs.), from its peculiar position below the surface of the ground, and on the brickwork being removed, the plates were found so dangerously thin all along the side, that holes were knocked through them with a light hammer. Some boilers have worked a long time with a brick covering to prevent radiation, corrosion was suspected beneath, and on removing the covering, every plate was found so thin as to make them quite unsafe. The tops of some plain cylinder boilers were frequently found wet from the leaking of the fittings and feed pipes, and as it was known that this could not continue without causing mischief, examination was urged, and the most dangerous corrosion was found, in boilers which ought to have worked many years longer without repair.

"A vast number of safety valves are found needlessly overloaded, while the steam gages are often out of order and inaccurate. As the gages become only gradually defective, the evil is not seen unless they are trusted long after they are incorrect. The habit of putting them on the steam pipes, where the pressure is always varying, causes them unnecessary wear. It is always best to have one attached close to each boiler, but where they must be in the engine house, or one has to serve for several boilers, they should be attached by separate pipes. It would often lead to great improvement, in the duty of engines working night and day, if the steam and vacuum gages were self-registering."

Poisonous Dyes.

At a recent meeting of the Académie Impériale de Médecine, M. Tardieu made a communication touching the poisonous action of some modern dyes. He reminded his hearers that M. Cerise had confirmed his former statements respecting the poisonous nature of coralline, by calling the attention of the Académie to a case of such poisoning produced by wearing socks dyed with this substance; and said further, that Dr. Despaull Ader had a marked case of the same kind, which, however, had not been published. Another case of a little girl who had suffered from the characteristic cutaneous eruption, brought on by wearing some garments dyed with coralline, of English manufacture, had been brought under his notice by Dr. Michalski, of Vierzon. These cases are examples of a special kind of poisoning, by means of a special poison—coralline—and are to be carefully kept distinct from other cases of a different kind, which M. Tardieu referred to. He mentioned that Dr. Viaud Grand-Marais, Professor in the Medical School of Nantes, had met with a case in which the poison contained in a dyed shirt was not coralline, but magenta, the well-known aniline-red. The poison in this case was the arsenic contained in the magenta, so that, strictly speaking, it was an example of arsenical poisoning. M. Tardieu called attention to the well-known fact of the employment of arsenic in the manufacture of magenta, and remarked that, despite all processes of purification, this dye almost invarably contains arsenic. In order to facilitate the collection of information relative to poisoning by means of dyes, and to avoid confusion, M. Tardieu gave a brief *resumé* of the distinctive chemical characters of the different organic red dyes to be met with in commerce. These dyes are six in number—garancine (madder), cochineal, murexide, carthamine, magenta, and coralline. The first three cannot be used in dyeing without a mordant; the last three are taken up by woolen or silk fabrics without it being necessary to employ a mordant. 1. Garancine (madder) is the most fixed of all the organic red dyes; it is not altered by a solution containing three or four per cent of hydrochloric acid or of ammonia. 2. Cochineal is turned violet by ammonia, and, at the same time, communicates a bright violet color to the ammoniacal liquid. 3. Murexide is bleached by citric acid. 4. Carthamine is decolorized by a short boiling with a weak solution of soap (about one part of soap in two hundred of water is enough). 5. Magenta is decolorized by ammonia. 6. Coralline is not diminished in intensity by contact with alkaline fluids. It is dissolved off the fabric by means of boiling alcohol, giving a red liquid, which is *intensified* by ammonia or potash, a character which at once distinguishes it from magenta. At the same meeting of the Académie, M. Chevallier observed that the confectioners who had been in the habit of coloring bon-bons with magenta, had received orders to substitute some other dye for that purpose.

Mr. Wanklyn, whose communications respecting the dangers of the modern dyes will be remembered, and who was, we believe, the first to point out the danger of arsenical poisoning, by means of magenta-dyed underclothing, writes to us to say that a composite dye is now very much in vogue, consisting of magenta, tinted with some orange-coloring matter. This dye, a splendid scarlet, very much used for underclothing, is doubly poisonous, and exposes the unfortunate wearer to the risk of being poisoned by arsenic, and the risk of being poisoned by an irritant orange dye.

The Great Pyramid.

The accurate measurement of the sides of the Great Pyramid, says the *Public Ledger*, is still attracting attention, and the result of the labors of the party of Royal Engineers of Great Britain, now engaged in this work, is waited for with much interest. The surveys, if correctly made, will settle many interesting points in reference to the units of lengths used among the ancients. Thus Herodotus states that the Egyptian cubit is equal to the Grecian cubit, and that the Great Pyramid has sides exactly five hundred Egyptian or Greek cubits in length, and covers exactly twenty-five aruræ or Egyptian acres, the arura containing one thousand square cubits. Again, the Parthenon at Athens, according to other historians, gives the Greek units of length, and by modern measurements of this ancient building, the mean length of the Greek foot is 12.149 inches, and of the Greek cubit 18·224 inches. Multiplying the cubit thus ascertained by 500, the length of the side of of the Great Pyramid should be 9,112 inches. The mean length of the side of the Pyramid as obtained by examining the structure itself, is calculated to be 9,110 inches, and thus a reasonably accurate standard of ancient measures has been fixed. The difficulty in the way of arriving at the true results is greatly enhanced by the fact that the casing stones of the Pyramid have been removed. The sockets cut in the rock to receive the corner blocks still remain, and the calculations as to the actual width of the casing stones are affected by errors arising from this source.

Fiber of Cocoanut Husks.

The method of converting cocoanut husks into useful fiber, is thus described in the *Mechanics' Magazine*:

The shell, or outer covering of the nut, is first soaked in a tank of water kept warm by steam. When sufficiently soaked, the shells are conveyed to a hopper, through which they are fed to a crushing mill, which consists of two coarsely-fluted rollers, between which the shells pass and are crushed. They are removed thence to the fiber mills. Here the shells are drawn in between two rollers, behind which are arrangements for tearing away the finer fiber and leaving the coarser in the hands of the operator, who presents first one and then the other half of the shell to the action of the mill. The coarse fiber is then carried away and prepared for conversion into brushes and brooms. The finer portions of the fiber are removed from the mill, and undergo a process of final dressing. This is effected by feeding them through a hopper into a circular screen, in which an Archimedean screw rapidly revolves. The fine fiber is delivered at the mouth of the screen, while the dust and smaller particles of fiber are carried through the sieve. The fiber thus produced is used for making mats and matting; the siftings find a ready sale with florists and market gardeners, for manure. The sweepings and refuse are collected and burned under the boilers.

Welding Powder.

A powder of the following composition, recently patented in Belgium, is said to be very useful for welding iron and steel together. It consists of one thousand parts of iron filings, five hundred parts of borax; fifty parts of balsam of copaiva or other resinous oils, with seventy-five parts of sal-ammoniac. These ingredients are well mixed together, heated, and pulverized. The process of welding is much the same as usual. The surfaces to be welded are powdered with the composition, and then brought to a cherry-red heat, at which the powder melts, when the portions to be united are taken from the fire and joined. If the pieces to be welded are too large to be both introduced at the same time into the forge, one can be first heated with the welding powder to a cherry-red heat, and the others afterward to a white heat, after which the welding may be effected. Another composition for the same object, consists of fifteen parts of borax, two parts of sal-ammoniac, and two parts of cyanide of potassium. These constituents are dissolved in water, and the water itself afterward evaporated at a low temperature.

LIQUEFACTION OF GASES.—Mr. Ladd has lately exhibited at the Royal Institution, London, a very elegant experiment, showing the liquefaction of gases by pressure. Three glass tubes, open at the bottom, containing cyanogen, sulphurous acid, and ammonia in their upper parts, and filled with mercury below, are inclosed in a strong glass cylinder filled with water. At the top of the cylinder is a small force-pump, which, when worked, drives more water into the cylinder, and forces the mercury, which acts as a piston up the tubes. As the mercury rises the gases are condensed, and now appear as liquids at the top. When the pressure is reduced by opening a stop-cock the liquids boil, and the gases speedily resume their normal dimensions.

A MONSTER BLAST.—A blast of unprecedented magnitude was recently set off at Smartville, California. The tunnel in which the enormous charge of powder, no less than 1,200 kegs—was placed, has been some time in progress. It was 570 feet in length, and undermined a mountain which it was desired to shatter for purposes of hydraulic mining. The charge was ignited by an electic wire, a romantic young lady being the one chosen to perform the task. The mountain was thoroughly shattered in the presence of thousands of people collected to see the novel sight.

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Improved Style of Two-Wheeled Velocipedes.

Some time ago we intimated that the perfect velocipede was yet to be built; since then we have secured patents on a number of improvements, not possessed by any of their predecessors, and thus the point of perfection is being attained. The one represented in the accompanying engraving is well worthy the attention of velocipede riders and builders, for its simplicity of construction, cheapness of cost, ease of management, and adjustability for suiting the size and strength of the rider.

The frame is of hollow pipe, the rear being a complete circle in which the steering wheel rotates on its axis, the driving wheel running between the parallel bars of the front portion. The axle of this wheel passes through boxes secured to the parallel bars by set screws, so it may be adjusted forward or back to suit the *physique* of the rider. The axle of the steering wheel runs in boxes secured to sliding bars curved to fit the inner diameter of the circular portion of the frame, thus allowing this wheel with its axle to perform an entire revolution within the frame on a horizontal plane. Its movements are controlled by means of rods attached at one end to the ends of the axle, and at the other brought together to the lower end of a lever directly under the rider's seat, the handle of which comes up in front of the rider, the fulcrum being on a cross piece between the rear portion of the parallel bars, serving not only that purpose but that of a brace. It will be seen from the figure that the guiding of the vehicle may be effected by one hand. The seat need not be so high as represented in the engraving; it may be lowered until nearly to the level of the reach, which is the horizontal line of the axles.

MC'DONALD'S ADJUSTABLE BICYCLE.

Such a vehicle is easily and cheaply constructed, and will operate with ease. The reach, which in the ordinary bicycle extends in an upward curve from the level of the rear axle to the top of the driving wheel, is easily made, while in others its forging adds greatly to the cost of the vehicle. In mounting the ordinary two-wheeled velocipede the rider must spring from the ground to a hight not easily reached by persons of obesity or of sluggish habits, and the danger of damage to both rider and vehicle is greatly enhanced by hight from the ground. If overturned, this machine cannot fall upon the rider, as the circular formation of the rear portion forbids a complete inversion. The danger of overturning this machine is still further diminished by the weight of the rider being brought nearer the center of suspension, as his seat may be brought very near the horizontal line of the axles without preventing or interfering with the action of his legs. The ease of guiding is sufficiently clear by an examination of the engraving, where the rider is shown as using only one hand for this purpose.

Patent pending through the Scientific American Patent Agency by C. E. McDonald, who may be addressed at Amsterdam, N. Y.

Cultivation of the Poppy and Manufacture of Opium.

We are in receipt of inquiries in regard to the cultivation of poppies, and the manufacture of opium; it having been suggested by certain agricultural journals that there are various parts of the United States where this industry might be profitably introduced. The failure of several attempts which have hitherto been made to produce this costly drug in America, is justly considered as an insufficient reason for supposing it impossible to succeed in other parts of the country possessing more favorable circumstances of soil and climate.

The opium, which finds its way to European and American markets, is raised principally in India, China, and Persia. The climate of these parts of Asia seems peculiarly adapted to the growth of the species of poppy (*papaver somniferum*), from which opium is obtained; accumulating in the juice of the plant the peculiar substances which form the complex compound called opium. The latter is the dried juice of the plant obtained by tapping the capsules, which allows the juice to flow out and stand in drops upon the surface from which it is scraped with knives when it is dried sufficiently. Another method, that of dissolving out the remainder of the juice after tapping, with water, and evaporating the solution has been also practiced to supplement the former.

Each capsule will yield opium only once by tapping. The tapping should be performed a few days after the flower has fallen, and the incisions should be made horizontally, and not so deep as to cut into the inner portion of the capsule, as should this happen, the juice would flow into the cavity and be lost.

Various experiments have been made in England, France, and Scotland, to produce opium, with encouraging results. So far as our knowledge extends the attempts made here have not given much encouragement of final success.

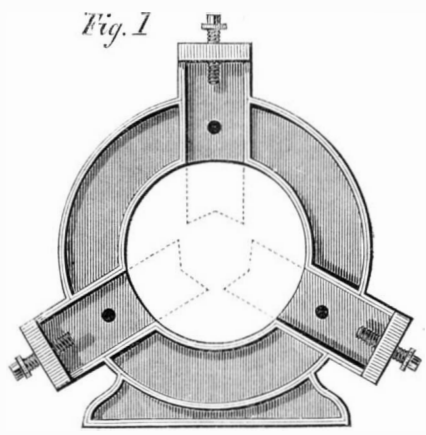
The poppy will grow luxuriantly in almost any fine rich soil. It may be sown in hills sufficiently wide apart to admit of cultivation, and harvesting the opium as the capsules mature. Experiment alone will suffice to determine what soils and what section if any in this country will answer well for its cultivation, and what quantity of seed will do for a given quantity of land.

We see no reason to doubt, that in the very diversified conditions of climate and soil to be found in the United States, there may be some sections well adapted to the culture of opium, and thus another drain upon the resources of the country be cut off by home production.

Shafting, Pulleys, and Belts.

No. II.

In our former article directions were given in regard to the preparation of the shaft sections for turning. The shaft having been centered and straightened is now ready for turning. Whatever may be the diameter of the shaft proportioned to its length, it should be supported about midway of its length by a rest secured to the ways of the lathe. Before adjusting this rest, however, the ends of the shaft should be squared up to the center hole with a side tool. If the vise centering was properly done, there is little danger of throwing the center out of true by this process. If so, a hand, half-round, conical-pointed reamer may be used to scrape the edge of the center hole until the shaft turns true. A good form of center rest is shown at Fig. 1, a front view. It is a casting in a circular form, with three equidistant projections for the reception of the bearing slides, shown in dotted lines in Fig. 1, and better in view, Fig. 2. These slides are simply plain castings with a slotted hole through their centers calculated, or filed to fit the recesses in the radial channels.



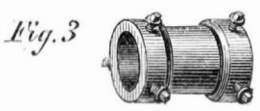


Fig. 3 is a thimble fitted with three set screws at each end, placed equidistant, and set up when the thimble is on the shaft until its turned surface between the collars at either end runs perfectly true. The use of this thimble is much better than hand-tooling or filing a place on the shaft at the middle to receive the bearing slides directly upon the shaft, as it is impossible to get the shaft perfectly round, owing to its springing. In lengths of shafts of small diameter, as one-and-an-eighth, or perhaps even one-and-a-half inches two of these rests may be advantageously employed. Sometimes, also, a follow rest attached to the carriage is used, but in practice we have not found this plan desirable; the friction is very great and the care of the tools, even in the first cut, is considerably enhanced.

The follow rest is simply a modification of the center rest, its main difference being that it is bolted to the carriage and moves with it. Some use, with the follow rest, a hardened steel thimble, bored to the finish diameter of the shaft, and sliding with the carriage. Its use is to be reprehended for its costliness, wear, close attention required, and other reasons apparent to the thinking workman. We prefer to do without the follow rest in turning shafting; the center rest is sufficient and preferable.

When the shaft is turned to a point as near the fixed center rest as the carriage can run, the lathe is stopped, the rest moved to the other side of the carriage, secured, and adjusted, and if the shaft is decently turned the thimble may be dispensed with, and the bearing slides of the rest brought directly against its surface. Some prefer to turn and finish the shaft at one operation by using two tool posts and a diamond point and a square nosed chisel at the same time. It is doubtful if anything is gained by this combination. All rolled bars—excepting the cold rolled shafting mentioned in the former article, which requires no turning whatever—are more or less out of round, and consequently the first chip is an uneven one; so if the finishing cutter is attached to the same carriage as the roughing tool, it will partake of the carriage's vibration, a vibration, however small, necessitated by the unevenness of the shaft's surface, and certain to leave the shaft out of round

Shafting is turned very rapidly by a method practiced in many shops of having a high auxiliary tool post at the back of the shaft, and a little in advance of the front one on the carriage. In this back post is secured a reversed diamond point that acts as the roughing tool. Other workmen discard entirely the use of the diamond point, and employ instead, a side, or squaring-up tool, setting it at an angle of about 20° to the shaft. Neither of these plans do we admire in practice, although employed by many first-class mechanics. Still, each is free to follow his own whim in this respect.

When couplings are turned on, the shoulder should be as light as possible, in order to retain the strength of the shaft. The key-ways should be milled or planed rather than chipped, as blows may spring the shaft. The couplings, bored, reamed, splined, faced, and turned, should be again faced after being seated and keyed on the shaft.

The pulleys should be chucked and trued by their outside perimeter, without regard to the hub or its cored hole. The old-fashioned way of chucking a pulley on an extemporized chuck of hard wood plank, secured to a face-place, has its advantages. In this case the face of the chuck is turned true, having a hole through the center for the reception of the hub and the passage of the drill and reamer, and a number around the circumference of the pulley for the reception of bolts. These bolts should be made hooked, instead of headed, for the embracing of the rim, and should be screwed up on the back with washers and nuts. We must say that this method of chucking pulleys for drilling seems to us more satisfactory than by the use of the scroll, or a universal chuck. The pulley has a bearing against the wood that appears to be superior to that on an iron chuck, and when once secured in place the pulley cannot be moved out of true.

Pulleys are, of course, turned on an arbor. The edges of the hub and the rim are first trued, the former with a side tool and the latter with a narrow edged cutting-off tool. Then the face of the pulley is turned, usually with a bevel from edge to center, but sometimes perfectly flat, according to its proposed use. If to be used by a shifting belt it should be perfectly flat, or straight. The pulley face may be finished by filing, and if considered necessary, polished with emery and oil; but on no account should the shaft be filed; its finish should be given by the square nosed tool and water, clear or soapy. The speed for turning is from 24 to 30 feet per minute, according to the quality of the iron. This may be readily understood by calculating the circumference of the shaft or pulley and the number of feet per minute. By a rough calculation a shaft of four inches diameter (twelve inches circumference), to run 24 feet per minute should have a velocity of 24 revolutions in the same time; one of two inches a velocity 96 or 100 revolutions per minute, etc. The feed for a shaft, in turning it, should be from 30 to 50 to the inch; that is, the shaft should revolve 30 or 50 times while the carriage and tool runs over one linear inch. These proportions may be varied according to circumstances, but the best work will be obtained between these proportions.

Balancing pulleys, calculations for machinery to be driven, and hanging shafting will be next considered.

Fastening Beams in Walls---Rat-proof Buildings.

A correspondent, G. W. Tinsley, of Minneapolis, Minn., says that the method of fastening beams in the walls of buildings illustrated on page 165, current volume, has been practiced in Louisville, Ky., for many years, and he thinks it is exacted by an ordinance of that city. He sends also a sketch and description of a method of rendering frame buildings rat proof. The plan is simply to nail to the sill strips of board between each flooring joist, on the inside, reaching to the under side of the flooring planks or board, and thereby covering the shelf formed by the sill between the joists. His idea is to allow the rats no place to stand upon while they are cutting through the floor.

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THE PATENT OFFICE BEFORE CONGRESS AGAIN.

Mr. Jenckes, from the Committee on Patents in the House, recently endeavored to secure the passage of a bill appropriating $6,000 additional compensation for draftsmen, and $15,000 to enable the Patent Office to lithograph drawings.

Mr. Beck opposed these amendments on the ground that they had not been before the Committee on Appropriations. Mr. Scofield got considerably muddled about the proposition of Mr. Jenckes, and thought the latter gentleman desired to place this money in the hands of the Secretary of the Interior and the Commissioner of Patents, so that they could take it from year to year without coming to Congress and asking for appropriations.

Mr. Jenckes said "No sir!" Whereupon Mr. Scofield desired to have the amendment read by the clerk, and finding that he had got off the track, dropped quietly into his seat and said no more on the subject.

Mr. Dawes, Chairman of the Committee on Appropriations, seemed to understand the matter better, but opposed the measure for the same reasons as were given by Mr. Beck; but Mr. Dawes waxed wrothy, and charged that the Patent Office, though growing in importance every day, had been seriously crippled between thieves on the one hand and inconsiderate legislation on the other, but he was unwilling to vote for Mr. Jenckes' amendments simply because he considered it an irregular way to appropriate money; and furthermore he was unwilling to allow the amendment to be inserted in the deficiency bill in the last hours of a fragmentary session of Congress.

Mr. Ela favored the measure for the purpose of allowing the Patent Office to avail itself of the new process of photo-lithography, by which every examiner, and every other person who may wish, may have copies of the drawings which are annexed to specifications of patents at the very low rate of fifteen or twenty cents each. "I hold in my hand," he said, "copies of some of those drawings by this new process, which cost only about fifty cents, while by the old process of producing copies for presentation to the courts, or for any other purpose, they might cost anywhere from ten to one hundred dollars. I look upon it as one of the most wonderful inventions of the age, and it is of such importance to the Patent Office that I hope this House will not refuse to allow that Office to avail itself of its use. It will not only be a great saving to the Government, but it will also be of the greatest advantage to those who have dealings with the Patent Office. By this process we not only get perfect copies of these drawings, but they may be enlarged or decreased in size as those who need them may require."

Mr. Jenckes tried again to convince the House that his amendment was necessary in order to enable the Patent Office to carry on its work harmoniously and to meet the just demands of inventors, but Mr. Dawes was inexorable though confessing that he did not know what were the necessities of the Patent Office. He seemed to cast some blame upon the Commissioner of Patents for his (Dawes') ignorance, as the Commissioner had been called before the Committee on Appropriations in reference to the estimates for the coming year, "but they got no information from him, and they brought in their bill without the benefit of his experience or knowledge of the wants of that department."

Mr. Jenckes, in his anxiety to get the measure through, asserted that "the Patent Office must necessarily break down after the first of July next, unless some such legislation as he proposed was carried into effect. The announcement of such a calamity had no effect upon Mr. Beck. He was unwilling to throw open the flood-gates and permit the Commissioner of Patents to expend money when he chooses.

In connection with the discussion, Mr. Jenckes is officially reported to have stated that the receipts of the Patent Office this year will exceed the expenditures by more than $1,000,000, which seems to us almost incredible, as the monthly receipts since January have not averaged quite $60,000.

In spite of Mr. Jenckes' persevering efforts, however, the amendment was lost, and we must now look forward to the fulfillment of his gloomy prophecy. We trust, however, that the Commissioner of Patents, upon whose shoulders appears to rest the responsibility, will take some active measures to avert the calamity

And here we should like to inquire what is the matter with the representatives of the thriving little State of Rhode Island? Senator Sprague has recently uttered some dismal forebodings of evil to the country; and now Representative Jenckes predicts an utter break down of one of the most useful departments of the Government unless a few more thousands of dollars are appropriated towards its expenditures. We can assure our readers, however, that they need not fear any such calamity. The business of the Patent Office will go on, and as usual. The alarm sounded by Mr. Jenckes, however, will do no harm. It may serve to wake up the officials to a keener sense of their duties.

THE HEATING OF BUILDINGS.

Nearly as much bosh is said and written on the subject of heating buildings as upon the subject of ventilation. In fact, the subjects are so intimately related, that it is almost impossible to consider them separately. We believe that the whole subject has been too elaborately treated by those who, in aiming to be ultra scientific, have failed to be practical.

There are four classes of heating apparatus which have had more or less favor, and some of which have been very generally used, viz.: Open fires in grates or fire places, inclosed fires (including the whole generation of coal, wood, and gas stoves), steam heaters, and hot air furnaces.

Of all the devices which the evil genius of invention ever put into the head of man to destroy health and comfort, we believe hot air heaters to be the very worst. Nothing but the utmost care, joined to the best constitution, can prevent an army of ills from subduing the health of those exposed to the influences of these agents of destruction. We speak from knowledge, having had a large experience in their workings, and the opinions we here express, are based upon sound science. It is almost impossible (the experience of those who have had the management of hot-air furnaces will bear us out in this), to so adjust them that an equable temperature can be maintained in any large building. They are most sensitive to external winds, which, as all acquainted with the subject know, influence, to a great extent, the supply of air from without. Even if vaned hoods be placed over the external openings, which admit the vital fluid, it will at once be seen that the varying strength of a wind, blowing from any direction, will render the supply fitful.

But this is not the only, nor the worst evil, attending the use of hot-air furnaces. Recent researches have established, beyond a doubt, that external warmth should be received by radiation; and that any method of warming the body by contact of its surface with a heated fluid is defective and sure to be attended by evil consequences.

Leeds, in his lecture on ventilation, says: "Convected heat is the great curse of the American people. It is that dry, lifeless, withering, debilitating, poisoned stuff with which most of our best houses and public buildings, and, most unfortunately, many of our school houses, too, are filled and warmed, and which is filling our systems, and warming and drying all the life and substance out of about two-thirds of the people of this country."

The same lecturer points out that the lower the temperature of the air we inhale, the more readily and copiously the lungs eliminate carbonic acid, and the languor and depression we feel, on a hot summer day, is attributed to this cause. In the hot-air system of warming, the surface of the body cannot be kept comfortable unless the air be maintained at a temperature much higher than necessary when radiant heat is used.

Professor Silliman has also pointed out that the combustion of organic matter which the air contains, partially unfits it for breathing, which adds to the category of charges against this most irrational way of heating rooms.

Bad as the system is, gas stoves are worse; at least such as provide no escape for the gases of combustion. They may, perhaps, be admissible in summer for culinary purposes, when doors and windows are opened wide, but we should as soon think of sleeping in an apartment connected by an open pipe with the nearest sewer, as in a close room warmed by a gas-stove.

There remain stoves, and steam apparatus, and grates or fire places, to which, in the order named, we prefix the adjectives good, better, best. A great hue and cry have been raised over the effects of stoves upon health. While we admit they have faults of both a positive and negative character, we believe these faults have been much over-rated. It must be confessed, however, that cast-iron stoves are open to the charge of not fully imprisoning the poisonous gases of combustion, while in other respects, they leave much to be desired. It is doubtful, however, whether anything will be devised that, for all classes of people, in all conditions of life, could take the place of the cast-iron stove.

Steam heaters, although not so good as open grates or fire places, come so near perfection, when properly constructed, that, when the consideration of their adaptability to heating large buildings is taken into account, they may be said to be the best of all the means yet invented for general heating purposes. They are deservedly popular, but the highest ideal of comfort, health, and cheerfulness in a heating apparatus seems to us inseparable from the open fire, with its cheerful glow, and its outward draft, which sucks in and devours all poisonous exhalations. It makes dust in a room, and this provokes good housekeepers to wrath, but, upon our own temper, we have found its effects to be most bland.

AN IMPORTANT OFFICE TO FILL.

TO PRESIDENT GRANT:—

You have doubtless been reminded, ere this, that there now exists a $3,000 vacancy in the Board of Examiners-in-Chief of the Patent Office, and it is very likely that several worthy gentlemen have been suggested to you as proper persons to fill that vacancy.

We desire the place neither for ourselves nor for any relative or friend. We have never thought it desirable to urge the claims of personal friends for Patent Office appointments. But representing about one-third of the whole clientage of that Office, we claim a right to say something to you about the selection of a proper person to fill this important position. In the first place the interests of anxiously waiting appellants require that the vacancy should be filled with the least possible delay. The cases on appeal are rapidly increasing, the interests of inventors are suffering, and it is of paramount importance that this work should be immediately and energetically reinforced. In the second place, and in view of the present composition of the Appeal Board, it is vastly important that the place should be filled by an active, vigorous expert, one who can grapple energetically with the many cases that now press the Board for Examination.

There are such men in the Patent Office—they are to be found among the younger and more active employés. We beseech you to give us a man of energy, and to avoid filling the place by the appointment of some venerable gentleman who might better be placed on the retired list. The Patent Office is increasing in importance; its duties are now indifferently performed; there is already felt a lack of energy in the management of its complex details, therefore it behooves you to select an energetic man, one who can make himself felt in the discharge of his duties.

Very Respectfully, Yours,
MUNN & CO.

PERSONS UNFITTED FOR THE COMMISSIONERSHIP.

There are, as usual, numerous applicants for the office of Commissioner of Patents, and all, or nearly all, are Solicitors of Patents. The attorneys for several of the mowing machines are especially prominent; the sewing machine patentees have their favorites, while india-rubber is content with the present state of things. Now, all these gentlemen may be worthy and competent; but we submit that they cannot be the proper persons to pass upon such questions as come constantly before the Commissioner of Patents. It is safe to say that there are no patent lawyers who are not pecuniarily interested in inventions, and a mere assignment of all such recorded interests would scarcely satisfy the public which sustains this important bureau of the Government. Aside from this, inventors would scarcely believe that a solicitor, who had for years been supported by the owners of a patented monopoly, would at once conquer the prejudices with which the earnest advocate is so apt to become imbued. The head of this department acts as a judge in suits of vast importance, and should be selected with a view to his judicial experience and acumen, as well as his executive ability; and not because of any part which he may have enacted in questions of priority and infringement.

We fully indorse the above from the New York *Times* of April 9th. A Commissioner of Patents should neither be a patentee, solicitor, or patent lawyer, but a man of good executive ability, and possessed of sufficient legal experience to weigh evidence and decide promptly in all cases that come before him. To this add honesty and energy, and you have all the requisites for a good Commissioner.

THE PACIFIC RAILWAY IMBROGLIO.

For some time past rumors have been hurtling in the air that the Pacific Railway would soon develop one of those great swindles which occasionally startle the community. A very curious lawsuit now going on in this city, between James Fisk, Jr., on the aggressive side, and the Union Pacific Railroad on the defensive, is operating to reveal some curious facts concerning an intermediate agency called the "Credit Mobilier," named after a similar financial vehicle in Paris, which went to smash about a year since. In the progress of the suit it was deemed important to get access to certain books of the "Credit Mobilier," but the key of the safe could not be found—some one holding it had gone to New Jersey, and it was uncertain when he would return. Here was a dilemma, which Justice Barnard, of the Supreme Court, solved at once by ordering a receiver to open the safe. This functionary, in company with several ingenious iron-workers, broke open the safe, got the books out, and bore them in triumph into the presence of the learned judge. With the aid of these, it is expected that some important revelations will be brought to light; but we apprehend that the real meaning of this seemingly inexplicable litigation will show itself as the plot unfolds, and respecting which we are beginning to get our first knowledge from certain proceedings in the Senate instituted ostensibly to protect the rights of stockholders. Senator Stewart, of Nevada, in some remarks on the subject, said it was alleged that the "Credit Mobilier" had made enormous dividends by using the Pacific Railroad. This the members of the "Credit Mobilier" admitted. The senator also said that they were encumbering the road with contracts ahead

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for their own benefit. Other senators, who pretended to know something about the Union Pacific Company, had said that the company was liable to become insolvent any day, and if that should come to pass, the result would be that the first mortgage bonds would be foreclosed, and the Government lien would be cut off, and this Congress would be held respon sible for it.

The importance of Senator Stewart's foreshadowing is made apparent by the fact that the Government has already issued $56,852,320 in bonds to the Pacific Railroad, upon which the company assumes to pay the interest; but if the first mortgage is suffered to be foreclosed, of course the people must be taxed to pay the interest on the whole of the above issue of bonds.

SPRINGS, THEIR POWER AND USES.

The peculiar property possessed by various materials, which has received the general name of elasticity, exhibits itself in many ways. Some substances manifest it, when compressed, in a high degree, while bars of the same material may be bent without developing elastic power to any great extent. Others on the contrary, exhibit great elastic power when bent, and comparatively little upon compression. Others, again, may be stretched without manifesting much elasticity, while upon bending they show it in a high degree.

Springs may be classed as follows: Flat, straight, or bar springs, coiled springs, spiral springs, and block springs, intended to resist compression, usually made of rubber, and in common use on railroad cars, etc., convex disks, concave disks, or a union of the two latter in a corrugated spring.

In metallic springs it is found that the elastic power resides in great measure near the surface. A well-tempered bar spring will lose much of its elastic strength by filing off a very thin scale from its surface. This fact has never yet been explained satisfactorily.

Power may be applied to springs in four ways. They may be stretched, compressed, bent, or twisted. The elasticities developed in the same material by these different methods of application, are not demonstrated to possess any ratio to each other. In fact, the mathematical data relating to springs are extremely meager, and it is greatly to be desired that some accurate experimenter would give to the world some tabulated results that could be relied upon with certainty as a guide in construction. At the present time there is nothing of this kind, so far as we know, that can be referred to.

It is evident from the fact above stated—namely, that the elastic power of springs lies, in a great part, near or upon their surfaces—that the form of the metal which presents the greatest surface will give the maximum power, within certain undetermined limits. The doubling of the thickness, the width remaining constant, will not give double power, while doubling the width will nearly double the elastic power if the thickness be the same.

But while the elastic force is found to be in some way dependent upon the surface, it is also evident that there must be some ratio which the thickness should possess in regard to the other proportions, in order that the maximum effects should be maintained. It is easy to see that were the leaves of an ordinary elliptical carriage spring much reduced in thickness their strength would be impaired.

At present the determination of the strength of springs is left almost wholly to experiment. It is plain also, that whatever data may be determined for springs having proportional dimensions, and considered as being formed of homogeneous material, and of the same temper, nothing but experiment could determine their strength with accuracy, for, although dimensions may be accurately determined, the quality of the metal and exactness of temper can never be relied upon as constant. Approximate results, however, might be obtained of great use in the construction of this important element of machinery.

The uses of springs seem constantly multiplying. A large number of most important machines, such as printing presses, and the like, employ them in almost all their forms. In many clocks, and all watches, they are the prime movers, while their employment for all sorts of vehicles need not be more than alluded to.

A class of rather visionary inventors have vainly (as yet) endeavored to use them as the propelling power for vehicles, and we receive many communications requesting our views upon the feasibility of so doing. While there is theoretically no impossibility, in the idea of such propulsion, we think we can see so many practical difficulties in the way of its accomplishment as to render its success extremely doubtful. These practical difficulties are so well known that they need not here be specified. Mechanical skill may possibly eventually overcome them, but let not the mistake be made that a spring possesses any more power than is delegated to it. It is only a magazine of power, and can give only what it has previously received. We should have considered this last remark unnecessary had it not been that the tone of some communications lately received indicates that their authors have not fully purged themselves of the old illusion of the perpetual motion.

PROTOPLASM.

Protoplasm is the scientific name for a substance which modern science has demonstrated to be common to all living things from the lowest plant to the highest animal organization. Prof. Huxley demonstrates that it may in itself exhibit all the phenomena of life. It contains oxygen, hydrogen, nitrogen, and carbon. Before these elements can form living protoplasm, they must unite to form the binary compounds known as water, carbonic acid, and ammonia. In the presence of pre-existing living protoplasm these compounds form a complex living substance, new protoplasm, which, Prof. Huxley so aptly terms the "physical basis of life." He says: "To this complex combination, the nature of which has never been determined with exactness, the name of *protein* has been applied. And if we use this term with such caution as may properly arise out of our comparative ignorance of the things for which it stands, it may be truly said that all protoplasm is proteinaceous, or, as the white or albumen of an egg is one of the commonest examples of a nearly pure proteine matter, we may say that all living matter is more or less albuminoid."

The living protoplasm of animals, a good example of which is seen in the white corpuscles of the blood, has not the power to influence the combination of the above-named compounds into new protoplasm. This power belongs only, so far as is at present known, to vegetable protoplasm, which, however, is not on that account to be considered as distinct from animal protoplasm. The latter has the power of converting dead animal or vegetable protoplasm into living animal protoplasm.

In this view protoplasm is the primary "matter of life," the first step from the inorganic into the organic world.

SKINNING AND STUFFING BIRDS.

The preservation of the skins of animals and stuffing them so as to preserve their natural appearance, is an art requiring considerable skill and taste. It is also of great utility in the study of natural history, as well as a very pleasing pursuit for amateur collectors.

We are requested by several correspondents to give some information upon the skinning and stuffing of birds. While no amount of verbal instruction can give practical skill and artistic taste in the preparation and mounting of specimens, what we may say will perhaps be useful as a guide to those who have just begun to exercise this instructive and amusing art.

It is more difficult to properly prepare and mount bird skins than those of other animals, as the preservation of the plumage in an unruffled and unsoiled state, is the point to be aimed at, and feathers, if broken, are very hard to re-adjust properly.

In killing birds with shot the feathers are very apt to be more or less damaged and soiled with blood, which, if it be permitted to dry on the plumage, will be difficult to remove without some permanent disorder in its arrangement. These evils may be in a great measure avoided if the sportsman will attend to the following directions: He should take the field provided with a small box of cotton wool, a bottle of water, and a small shallow dish of some kind to hold a small portion of water at need. He should also be equipped with some small sable brushes, such as are used in water color painting, and a short piece of stiff wire with the end rounded. As soon as he has shot a bird he should aim to get it in hand as soon as possible, and plug the shot holes with cotton to prevent further bleeding. In doing this he will find the wire above alluded to a very useful instrument. When the bleeding is stopped, he should next cleanse the feathers from the blood which has already flown, by using the water which he carries for the purpose and the brushes. If the blood is thus removed before it dries, it can be so completely washed off as to leave no stain even on the whitest feathers, and at the same time their texture may be preserved from damage. Should any of the feathers become so much bent as to be difficult to straighten, they may be restored measurably by soaking in hot water.

Before skinning, the principal dimensions of the bird should be taken and noted down for reference in mounting. The first incision should be made longitudinally backward from the lower point of the breastbone. From the beginning of the operation to the conclusion, all fluids should be constantly absorbed by cotton wool, the greatest care being taken that they do not flow out and soil the feathers. As fast as the skin is separated from the body a thin layer of cotton should be inserted to prevent its adhering to the flesh and for purposes of absorption. Through the incision made as directed the entire process of skinning must in general be performed. When the skin is stripped down from the muscular portions of the legs, they must be cut off on the inside of the skin with scissors or a knife so as to leave the feet attached to the skin. The tail is likewise cut off on the inside at its attachment to the back. The body can then be suspended from a hook and the skinning proceed toward the head by turning the skin inside out. When the wings are reached the skin should, if possible, be removed as far as the joint constituting the elbow, but if it is found difficult to do this without tearing the skin, the bone may be severed as low down as practicable, by use of cutting pliers or strong scissors. Great care will be needed to avoid breaking the delicate membrane which constitutes the external ear upon the heads of birds which are nearly or quite bald. Care is also required in manipulating the eyes, the external membrane of which ought, if possible, to remain unbroken. The brain is removed from the skull through incisions made well back through the roof of the mouth. All loose flesh and fat about the neck, tail, and legs, should be removed from the skin. For this purpose the skin on the wings may be cut through on the inside, when it covers those parts from which the bone and flesh could not be removed. The parts liable to decompose may then be rubbed over on the inside with arsenic, or arsenical soap, which will effectually prevent decay.

The skin is now ready to be stuffed, which although it seems simple in description, requires considerable skill. If glass is not used for the eyes their orbits should first be stuffed through the mouth with cotton. Next the upper parts of the throat should be filled with the same material. A roll of cotton should now be inserted through the first incision, and pushed up through the neck to the base of the skull. Then the body should be filled, during which process the wires for supporting the bird when mounted should be inserted into the legs, neck, and wings. This completes the process so far as it can be described in words, with the exception of sewing up the opening through which the stuffing has been performed. This requires no special skill to be performed neatly.

Some slight variations in the method are requisite, according to the character of the bird. For instance, a very large bird may require to have the neck cut off when the skull is reached, and the skinning of the head to be performed by an incision from the outside down the back of the skull.

In mounting birds there is room for considerable display of taste in the adjuncts. A branch of the tree which the bird most affects, with artificial leaves, may be used with good effect as a support for the feet. The natural beauty of the plumage may be enhanced by suitable contrasts of color in the lining of the case where they are kept. An aquatic bird may be shown holding a fish in its mouth, such as it commonly obtains for its food, and many other fancies will suggest themselves to those who wish to excel in the art.

The directions we have given will, if observed, enable any ingenious person after a little practice to skin, stuff, and mount a bird creditably.

WHY DON'T BOYS LEARN TRADES?---MECHANICAL LABOR.

Our recent agitation of this question and subject has brought us a number of communications. We do not propose to iterate and reiterate our statements or suggestions. We have already stated the facts, and pointed out the possible and practicable remedy. It is perfectly simple, and entirely feasible. But we give the gist of a few of the communications we have already received, in order to show the general feeling on the subject, and in the hope that those in whose hands the remedy lies may be induced to apply it. A young man, signing himself "Eugene Dunbar, of Holliston, Mass.," says: "There are many boys, myself included, who would be very glad to learn some good trade. For several years I have been very desirous to learn the trade of a locomotive machinist, but, although not too proud to take an apprentice's position, I have not met with success in my endeavors to obtain a chance to learn the business."

Another writing from Georgetown, D. C., referring to our article published on page 169, current volume, under the heading, "Why is Mechanical Labor Objectionable?" says: "Education is everything. But just so long as we train our young people in literature and the classics, we must necessarily breed a race of men and women lazy in the qualities demanded by mechanical labor. Our school system needs a thorough remodeling. Our farmers' sons, after passing through a course of literary training lose all taste for the noble art of cultivating the soil. We should have a more healthy state of society, if, at school or college, our children were thoroughly instructed in a practical knowledge of mechanics and agriculture. The cultivation of the soil demands for its intelligent management a knowledge of chemistry, botany, geology, of fruits, trees, rearing of cattle, of the properties and uses of manures, etc., all of which afford pleasure, and give healthy mental and physical occupation. He who is once initiated into this science of sciences, and its application, will not quit the cultivation of the soil for any meaner profession. Literary training, instead of being the principal object of school education, should be considered a recreation, and the practical should take precedence."

E. W. Dean, of Norwich Town, Conn., also writes that he has passed through the ordeal, having been a clerk three years, where his hands were kept soft and white, and then became a machinist's apprentice. This was hard on his hands, and insured his receiving the cold shoulder from his acquaintances, who before welcomed him. He, however (very wisely, in our opinion), prefers his position of independence as the master of a useful art than as a mere caterer to the tastes of purchasers of finery.

The following from the Philadelphia *Morning Post* is allied to the general subject, and we therefore copy it: "The late report of the directors of Girard College shows not only the great changes that have in late years taken place in our social and business systems, but a very unpleasant result in regard to the college. There are now forty boys in the institution who are ready to go out, but who are obliged to remain because there is no one willing to receive them under indentures, as provided by the will of Girard. The system of indentured apprenticeship having fallen into discredit and disuse, these boys are unable to find masters, and must, therefore, remain in the college, occupying the places of many who are ready to enter, thus interfering very much with the usefulness of the institution. There is, it appears, no legal way of disposing of these pupils, who have gone through the prescribed course, and have drawn from the college all the benefits to which they are entitled.

"According to the will by which the institution was founded and governed, these boys must be bound out to learn a suitable trade. That patiently waiting for persons willing to take them under these conditions will be of any avail we doubt. Every month, every year will find fewer and fewer business men adhering to the old system of apprenticeship. Every year the number of boys who have graduated but cannot leave the college, will increase, until in time the whole establishment will be filled with its alumni, to the total exclusion of new scholars, and this body of graduates must, we suppose, stay there until they are old men, and every time an octogenarian drops off, a boy may be admitted.

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the legislature is empowered to pass such a law as may enable the Board of Directors to place the boys at suitable trades and callings without the necessary accompaniment of an indenture, it should immediately be done."

VELOCIPEDE NOTES.

One of the most brilliant exhibitions of skill in velocipedestrianism that has ever taken place in this city or elsewhere, took place at Apollo Hall, corner of Twenty-eighth street and Broadway, a few evenings since, under the direction of the Pearsall Brothers. Dodworth's band was present, and the evolutions of the skillful riders present on the occasion were rendered more pleasing by the accompaniment of splendid music, for which this celebrated band is distinguished. The tournament opened by the entrance upon the floor of twenty-five of the most expert riders in the country, whose advent called forth immense applause, renewed as the graceful evolutions of the performers excited and delighted the admiring assembly. The affair was very select, and was attended by a large and fashionable concourse of ladies and gentleman.

Nearly all the bicycles in popular favor were represented, but the most attractive feature of the evening was the performance of a sister of Messrs. Pearsall, on a beautiful little ladies' velocipede, which has been appropriately called the "Peerless." This machine has low wheels, and is propelled by treadles connected with the cranks, so that a special dress is not required by the fair rider. It is altogether a most attractive design, and will, we think, speedily become a favorite with the fair sex.

A two hundreddollar Pickering velocipede is offered by the Pearsalls, to be competed for the fastest time in a half mile at the Gymnacyclidium, on Thursday, the 15th inst. The machine is mounted with silver plate and ivory fittings, and is a gem.

A challenge has been put forth by Mr. Frederick Hanlon, who offers to race any velocipedist of the United States for a thousand dollars a side and the championship. The race to take place in this city or Brooklyn, half mile heats, best two out of three. The time between the heats to be ten minutes. The party accepting the challenge to choose his own velocipede, the fore wheel of which shall not exceed 37 in., except it be a Demarest, in which case the fore-wheel shall not exceed 41 inches.

The *Herald* says: "It is probable that a Brooklyn expert will accept Mr. Hanlon's $1,000 challenge, and that the race will be arranged to come off at the Empire City Rink."

Mr. Stephen W. Smith has commenced a suit against Mr. Calvin Witty for alleged infringement upon patents originally granted to Philip W. McKenzie, of Jersey City, and subsequently assigned to Mr. Smith. The McKenzie invention was illustrated in these columns a few weeks ago.

Much diversity in opinion, as to the proper dimensions of the velocipede wheels and cranks, has existed, but the favorite size seems to be from 30 to 36 inches for diameter of driving wheel, and 6 inches for length of cranks. We have seen larger ones, but we doubt that they will be much used so long as the bicycular form of velocipede is considered the best.

Since writing the paragraph in regard to rubber tires for velocipedes, we have had submitted to us a number of plans for fastening them. To fasten them firmly has been the difficulty heretofore. Some of the plans proposed seem well adapted to meet the requirements of the case, but actual trial can alone demonstrate their value.

We saw recently a bicycle propelled up the heavy grade from the Wall Street Ferry to the top of the Brooklyn Hights. We were too far away to ascertain the maker of the machine, or the name of the rider. When we add that this grade is certainly not less than one foot in ten, our readers will appreciate the significance of this statement, with reference to the possibility of overcoming steep grades. The rider ascended the entire grade, certainly not much less than three hundred yards in length, using the flagged sidewalk as a way.

The *Brooklyn Union* says, the fastest time yet made on a velocipede in this country, was that made by Messrs. Burroughs and Demarest, on the night of the third inst., on Demarest machines, with 45-inch and 41-inch driving wheels. The trials took place on the mammoth rink in Third avenue, and the machines which were ridden were the Demarest, Wood, Pickering, Mercer, and Monod, and the Union Hardware Company. Previous to the race the Tilton Brothers and the two Tildens did some bicycle gymnastics, and the display was much admired. We heard a suggestion made that the exhibition would be preferable if the two parties went in couples rather than in a quartette. After the fancy riding came the races. The course was half a mile, three times the circuit of the hall, the center of the hall being marked off by rows of seats for exercise riding. Mr. Burroughs led off on a 45-inch Demarest, and he went round at a startling pace, making his first circuit in eighteen seconds, great time for the sixth of a mile. He, however, started too fast to keep up his pace, and he occupied 72½ seconds in doing the entire distance. Darling was the next, and he made the half mile in 71½ seconds on a 41-inch Demarest. Young Hamburgh now tried in on a a 33-inch Union Company machine, and he made excellent time, coming-in in 85½ seconds. Mr. C. D. Demarest now got on a 41-inch Demarest machine, and he flew round the hall at a rapid pace, coming-in in 68¾ seconds!—the fastest half-mile time on record. A Mr. Weed then tried a 38-inch Pickering, but it took him 90 seconds to go the half mile. G. Tilden then tried his skill on a 45-inch Wood machine, and he did his half mile in 76½ seconds, his brother doing it in 83½. A rider named Capeless was the last, and he went round on a 35-inch Monod in 84 seconds, and thus ended the trials.

Editorial Summary.

The State Engineer of New York has transmitted to the Legislature his report for the year ending September 30, 1868. This document furnishes the aggregate statistics of 157 companies, as follows: Total cost and equipment of steam roads, $208,185,783; horse roads, $21,133,522. Passengers carried by steam roads, 18,434,300; tuns of freight carried, 11,961,632. Number of passengers carried in city cars, 146,326,486. Cost of maintaining steam roadway, $13,074,595. Cost of operating roads, $15,250,716. Earnings, steam roads, $49,377,790; horse roads, $8,262,291. Persons killed on steam roads, 302; injured, 358. On horse roads, killed, 13; injured, 90. During the year ending September 30, 1868, under both the general railroads law and special acts, thirty-six companies, with a total capital stock of $23,125,000 and a total length of 750 miles, have organized and filed their articles of association in the Secretary of the State's office. During the same year, 169 miles of railroad, under twelve companies, have been opened.

BUSINESS OF THE WORLD'S RAILWAYS.—*Van Nostrand's Engineering Magazine*, says that according to the calculations made by the Government Statistical Office at Berlin, the number of passengers conveyed daily by the railways of the world amounts to three millions, and the quantity of goods to twenty-seven millions of ceutners, or a million and a half of tuns. Also 58,000 telegrams are forwarded, and four millions of letters delivered every day. The daily gross receipts of the railways are 8,000,000 florins; they possess 40,000 locomotives, 1,200,000 carriages and vans, and give regular employment to a million persons. The aggregate length of the telegraph wires would, if united, reach to the moon and back again.

THE great Polish salt mine, recently noticed as in danger of being destroyed by the inundation of water, is pronounced safe by the committee of seven of the principal engineers sent to institute an inquiry on the subject. These functionaries have now sent in a report to the effect that the irruption of water is not of a nature to destroy the mines or prevent their working; and that the forcing pumps for emptying the pit are now nearly all set up.

COAL OIL BURNERS.—We are receiving inquiries in regard to the report of the committee appointed by the American Institute to test coal oil burners, sent to them for that purpose, in pursuance of a notice published sometime since in the SCIENTIFIC AMERICAN. The report will undoubtedly be made in due season, when we will give our readers the benefit of the results obtained.

NEVER HEARD OF IT.—A rustic gentlemen called at a wholesale store the other day, and after purchasing a bill of goods, was asked by the junior proprietor if he had "ever seen a velocipede," "Is that the machine that adds up three columns of figures at once?" said rustic. The reply was in the negative, and he was piloted round to a velocipede school and introduced to the mysteries.

A COTEMPORARY says that two gentlemen in Meriden, Conn., have completed the invention of a needle manufacturing machine. This machine takes in the wire and turns out a completely finished needle—except pointing, hardening, and tempering!

SOLUBILITY OF INDIGO.—M. Camille Kœchlin has discovered the curious fact of the solubility of indigo in alkaloid, salts, and particularly in the acetates and chlorides of aniline, morphine, etc.

VELOCIPEDE PATENTS.

In the United States Circuit Court, April 5th, the suit of W. Smith agt. Calvin Witty was heard. The plaintiff charged that the defendant had infringed on his patents for improvements in velocipedes, and prayed that an injunction be granted. He averred that Philip W. McKenzie, of Jersey City, had obtained at various times three patents for improvements in velocipedes, and had sold the same to him; that he (Smith) had, at great trouble and expense, been manufacturing, for sale, velocipedes made under said patents, and that he will realize large gains therefrom if infringements are prevented; that various parties in different parts of the United States have acknowledged the validity of his (Smith's) claim to said patents, and have taken license thereunder, but that Witty has continually, in violation of his (Smith's) rights, made and sold velocipedes containing the improvements patented as above stated, and that he is still doing so. Smith further says that despite due notice on his part, Witty has refused to desist from infringing these patents. He therefore prays that Witty may be enjoined from continuing these alleged infringements; that he may be compelled to pay him (Smith) the profits he has acquired and the damages he (Smith) has sustained by such alleged infringements, and that Witty be compelled to make a discovery of how many velocipedes, infringing, as alleged, his (Smith's) patents he has made, and how many he has sold. A motion for Witty to show cause why the relief asked should not be obtained is to be argued.

The McKenzie patent, under which Smith claims, is illustrated on page 181, and the patent of Lallement, owned by Witty, on page 102, present volume, SCIENTIFIC AMERICAN.

NEW PUBLICATIONS.

GEOLOGY OF NEW JERSEY, 899 pages large octavo, illustrated by 108 Photolithographic Engravings and Woodcuts, and six Mine Maps; and accompanied by a portfolio containing Maps in sheets of

1. Azoic and Paleozoic Formations, including the Iron ore and Limestone districts; colored. Scale, 2 miles to an inch. 2. Triassic Formation, including the Red Sandstone and Trap-rocks of Central New Jersey; colored. 3. Cretaceous Formation, including the Greensand Marl Beds; colored. Scale, 2 miles to an inch. 4. Tertiary and Recent Formations of Southern New Jersey; colored. Scale, 2 miles to an inch. 5. Map of a Group of Iron Mines in Morris County; printed in two colors. Scale, 3 inches to 1 mile. 6. Map of the Ringwood Iron Mines; printed in two colors. Scale, 8 inches to 1 mile. 7. Map of the Oxford Furnace Iron-ore veins; colored. Scale, 8 inches to 1 mile. 8. Map of the Zinc Mines, Sussex County; colored. Scale, 8 inches to 1 mile. Price of the book and portfolio of maps, $5·00. Same, without portfolio of maps, but containing a folded and colored map of the State, on a scale of 5 miles to 1 inch, $4·00. Single copies of either of the above maps, colored and in sheets, 50 cents. The prices are fixed to merely cover the cost of paper, printing, and binding; the expenses of the survey and preparing book and engravings being paid by the State. These publications can be had from Prof. George H. Cook, State Geologist, New Brunswick, N. J., on remitting the price, or through the booksellers. A valuable book, from which we can promise our readers some interesting extracts, as soon as space will permit their appearance.

FORCE AND NATURE, ATTRACTION AND REPULSION; THE RADICAL PRINCIPLES OF ENERGY, DISCUSSED IN THEIR RELATIONS TO PHYSICAL AND MORPHOLOGICAL DEVELOPMENTS. By Charles Frederick Winslow, M. D. Philadelphia: J. B. Lippincott & Co.

We have endeavored, before expressing our views in regard to this book to read it in a perfectly candid spirit of inquiry. We confess that we found it hard to maintain that spirit to the end. Its style is at times forcible, and its author has evidently caught more than a mere glimpse of certain fundamental truths; but while saying this much, we are compelled to add that it is one of the most illogical books we ever attempted to peruse. It is full of fantastic speculations, and contains not a few errors in its statements of facts. It is wearisome, from its interminable repetitions, and its diffuse method of discussion will hardly fail to draw upon it the severe criticism of thinking readers. In short, it is to philosophy what punch is to the palate, full of incongruities; and, although too much diluted by redundant forms of expression, still quite palatable, but not very nutritious. Claiming at the outset to assume nothing, it ends by assuming everything. Written to enunciate what is evidently a pet theory of the author, namely, that repulsion is equal in quantity to attraction, and that the two are coexistent, and the foundation of all material existence, it will convince few, while its speculations will, if we mistake not, draw upon its author a storm of adverse criticism.

THE AMERICAN YEAR BOOK AND NATIONAL REGISTER FOR 1869. Edited by David N. Camp. Hartford: Published by O. D. Case & Co.

This work is, as its preface informs us, the initial volume of a proposed annual publication, prepared to meet an increasing demand for information respecting the affairs of the General and State Governments, public institutions, finances, resources, and trade of this country; the political, financial, and social conditions of other countries; and various other subjects relating to social and political economy. The work is a thick 8vo, printed and bound in excellent style; and, so far as we can judge from a hasty review of the large mass of statistical information it contains, seems a valuable work of reference.

WE have received from the publishers in Berlin, Messrs. A. Effert and Lindtner, a copy of the "Verhandhungen des Vereins zur Beförderung des Gewerbfleisses in Preussen (Transactions of the Society for the Advancement of Useful Arts in Prussia), for 1867; being the sixty-fourth year of the existence of the society. The members of this society include not only the King of Prussia, and other royal personages, but also the most scientific men of the kingdom. It also comprises a large number of scientific and industrial associations. These facts a are sufficient warrant for the value and interest of its contents. The present number for January, February March, and April, 1868, contains the business transactions of the society, list of members, minutes of meetings, list of premiums offered for valuable inventions, followed by articles illustrated with profuse and finely-executed engravings, upon the following subjects: "On the Production of a Green Coating on Bronze;" "On Stamping Presses;" "On Kapselräder," in which category are included rotary pumps, wheels, etc., "On the Resisting Power and Elasticity of Wrought Iron Double T-Beams;" "On Boiler Explosions in Prussia during the Year 1867." It also gives a list of new patents granted in Prussia during 1867; and a table of prices of wool in all the market towns of the kingdom during the year.

"THE LITTLE PEAT CUTTERS; or the Song of Love," is the attractive title of a new volume of the Sunday school series of choice religious works published by Henry Hoyt, Boston. "Kate and Her Brother," also published by the same firm, will prove an interesting story for the little ones. For sale in New York by N. Tiballs & Co., 37 Park Row.

WE have received parts 13 and 14 of "Locomotive Engineering," edited by Zerah Colburn, and for sale by John Wiley, 535 Broadway, New York. They fully maintain the character of the previous numbers received, and are unsurpassed in beauty of illustration and typographical execution.

PART VI. of "Packard's Guide to the Study of Insects" is also at hand, profusely illustrated, and full of entertaining and instructive matter.

"Van Nostrand's Eclectic Engineering Magazine" makes its appearance for April, with a well-selected array of engineering and mechanical essays, and items.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

G. J., of Me., says, "a combined steel and iron rail of excellent quality is manufactured in Portland, Me." This in commenting on an article in the SCIENTIFIC AMERICAN published on page 213 current volume copied from the London *Engineer*. We do not hold ourselves responsible for statements made by other journals and copied into our columns.

C. M. B., of Conn.—We propose in our series of articles on "Shafting Pulleys and Belts," now in course of publication, to give some directions in relation to pulleys and belts, relative diameters, etc., which will better meet your case than any reply we can make in this column.

P. J. P., of Mass.—To turn a true taper on the lathe, the cutting point of the tool should be exactly at the center of the piece which is to be turned. In ordinary turning it is better to keep the point above the center.

J. H. W., of Pa.—The reason why your cold chisels break is to be found in your hammering them when nearly cold, to "smooth finish' them, as you say. It is certain that this extra finish produced by hammering refines the steel—compacts its fibers—and thus changes its texture, and consequently its before ascertained quality. It will not stand so high a temper. All the hammering required is that necessary to bring the chisel into shape while hot, changing the texture of the metal as little as may be.

H. O. B. of Mich.—You are mistaken in supposing that a very great distance is necessary between shafts connected by a quarter turned belt. We have seen them run at only three diameters apart; that is, two six-inch pulleys only six inches between their perimeters, the centers of the shafts only twelve inches apart. Width of belt is an obstacle in the way of extending the principles of runn ing turned or twist belts. In our answer to "W. H. of Pa.", on page 251, the "15 feet" should have been 30 feet. This matter of belts will receive further attention in a subse quent article, one of a series on "Shafting, Pulleys, and Belts" now being published in these columns.

H. McD. of N. Y., will see his critical note embodied in an article on the same subject to appear soon. His suggestions are worthy the subject and will receive due attention.

J. I. G., of Pa.—You can brown your gun barrel by coating it with oil (sweet oil) and heating it over a fire. We prefer, however, the use of acid as giving a darker and more even color. If the surface is properly cleaned before applying the acid there will be no difficulty in getting an even shade.

B. R., of Iowa says, in relation to prevention of limy incrustations in boilers, mentioned on page 219 current volume, SCIENTIFIC AMERICAN, that the use of oak saplings therein mentioned is really advantageous, as he has used it successfully for twelve years and never knew it to fail. Or put half a bushel of common (Irish) potatoes in the boiler and no more trouble will be experienced. As to patent powders he has never tried them.

E. H., of Mass.—In Shaffner's Telegraph Manual, page 605 and those succeeding, you will see sections of just such cables as you describe, containing more than one insulated conducting wire.

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M. and Sons, of Ill., have a boiler 14 feet long, 30 inches diameter with 18 three-inch tubes, which become clogged with "soot" from the bituminous coal. The stack, of plate iron, rises 40 feet. The hight of stack is ample, unless adjacent structures, or natural obstacles, as hills, etc., obstruct the draft. If the boiler is horizontal there is no reason why the flues or tubes cannot be cleaned with a brush or scraper. If upright, the stack might be placed near the boiler, but not directly over it, and the elbow have an opening, or cover, for introducing the brush. But, after all, the truly scientific and correct way to remedy the evil is to consume the soot, which is only unconsumed fuel, and is in this case worse than wasted. We refer our correspondents to No. 9, Vol. XVII, SCIENTIFIC AMERICAN, first page, which contains an article on boiler-setting that may be suited to their case.

N. G. P. of Del.—So-called liquid glue is made by dissolving shellac in wood naphtha. A quarter of a pound, apothecaries' weight, of the gum to 3 ounces of naphtha.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Orders for Patent Reports, Books, Wedding Stationery, Printing and engraving of all kinds received and sent to all parts of the country at city prices. Other commissions attended to. A. W. Macdonald, Room B, (adjoining Scientific American Office), 37 Park Row, New York.

India-rubber articles of every description for inventors and others, furnished by W. G. Vermilye, 6 Park Place, New York.

Keuffel & Esser's, 71 Nassau st., New York, the best place to get first-class drawing materials.

For accommodations and assistance in the manufacture of any good patent cultivator, address A. J. K., New Haven, Conn.

Wanted—An experienced agent for selling steam engines and other machinery. Address box 109, Waynesboro, Franklin county, Pa.

Wanted.—Parties having first-class engine lathes and plaines to sell, new or second-hand, address A. L. Henderer, Binghamton, N. Y.

A Six-Horse Power Engine and a Ten-Horse Power Boiler wanted. Address Journal and Courier, Little Falls, N. Y.

Reuben B. De Barr, late of 156 Grand st., call or address Geo. W. Gibbons, 446 Broome st., N.Y., who has something important to communicate

Manufacturers or inventors of washing machines or boilers, and of meat cutters, send full description to Postoffice Box 3,522, New York.

Wanted—A steam heater or vulcanizer, 3 or 4 feet diameter, about 3 ft. long. Also, a steam table or plate. Address, with particulars, India Rubber, Herald Office, New York city.

Wanted—a machine that will punch rapidly & cheaply soft pine ⅜-in. thick, and hard woods ⅛-in. S. A. Nelson, box 51, Georgetown, Mass.

Wanted—A simple, quick, accurate mitering machine for picture frames. Wilson & Walke, Norfolk, Va.

John Stanthorp's Patent Candle Machine was extended March 5, 1869, for 7 years. Address 30 Cortlandt st., New York.

Wanted—Drawings of the best American sleeping car, with all details. Parties willing to furnish them will please G. L., Box 6760 P.O., N.Y.

Wanted—Scientific American, First Series, Vols. 2, 3, 4, 5, and 6. Address W. Elliot Woodward, Boston Highlands, Mass.

Rights, or whole interest for sale—guide attachment for boring instruments. Address A. A., Postoffice box 4769, New York.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

A milling machine for sale, price $210. Also, 5-ft. floor drill lathe, price $75. Are Lincoln's make and used but few months. E. S. Miner, Burrville, Conn.

H. C. Sandusky & Co., General Agents for the sale of patents. Rights, territory, and patented articles sold on commission, 12 Mill st. opposite Postoffice, Lexington, Ky.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

An experienced patent-right salesman, about starting out, will sell a first-class article, not interfering with his own, on commission. Address, with full particulars, Box 311, Elwood, N. J.

For the best velocipede, and other small forgings, address R. A. Belden & Co., New Haven, Conn.

The new method for lighting street lamps! For illustrated circular, with letter from President Manhattan Gas Light Co., and Sup't of Lamps N. Y. City. Address J. W. Bartlett, Patentee, 569 Broadway, N. Y.

For the latest improvement see the Inventors and Manufacturers' Gazette. The cheapest illustrated paper in the world. $1 per year. Published by Saltiel & Co., Postoffice box 448, or 37 Park Row, New York.

200 bars 1-in. octagon tool steel, best quality, for sale.—The lot at 14 cents per lb. Sweet, Barnes & Co., Syracuse, N. Y.

Rare chance for agents. D. L. Smith, Waterbury, Conn.

The Tanite Emery Wheel.—For circulars of this superior wheel, address "Tanite Co.," Stroudsburgh, Pa.

Money Plenty—To patent and introduce valuable inventions for an interest in them. National Pat't Exchange, Buffalo, N.Y. Inclose stamp.

The manufacture and introduction of sheet and cast metal small wares is made a specialty by J. H. White, Newark, N. J.

The Magic Comb will color gray hair a permanent black or brown. Sent by mail for $1·25. Address Wm. Patton, Treasurer Magic Comb Co., Springfield, Mass.

For coppered iron castings address J. H. White, Newark, N. J.

W. J. T.—We think the patent asbestos roofing manufactured by H. W. Johns, of this city, is the best substitute for tin or slate. It is cheap and easily applied.

Tempered steel spiral springs. John Chatillon, 91 and 93 Cliff st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of Parker Brothers' Power Presses.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 00 a year

MANUFACTURING, MINING, AND RAILROAD ITEMS.

Immense discoveries of gold placers are reported from Alaska. The mines are on the main land, 120 miles from Kodiak Island, in latitude 61 degrees north, and longitude 100 degrees west from Greenwich. Three several discoveries have been made; the first on Kuyack river and Chigmet mountains, the second about 60 miles above Sitka, the third on an ocean island, the name of which is unknown. The mines, on account of the climate, can only be worked five months in the year.

The Fulton Iron Foundery, at Pittsburgh, Pa., are doing some heavy work. Among their recent productions is a fly wheel used in the Union Mills, of that city, which weighs 22½ tuns, and was cast in one piece. At these works chill rolls 30½ inches in diameter and 96 inches in length of body, have recently been made, each casting containing 15½ tuns of metal.

The Yantic thread company of Fall River, Mass., has decided to erect a mill with 5,000 spindles to spin yarn. The Fall River manufacturing company will build on the site of its cotton mill, burned down in May last. The new mill will contain 25,000 spindles and 600 looms, and will weave 6,000,000 yards of prints annually. The old mill had only 9,000 spindles and 185 looms.

A cotton mill with 10,000 spindles is to be started at New Orleans, and a similar one at Savannah, Ga. Within a few weeks $600,000 worth of manufacturing stock has been subscribed for at Columbus, Ga.

The production of beet-root sugar in Europe last year was as follows: 220,000 tuns in France; 165 in Germany; 97,500 in Russia; 92,500 in Austria; 32,500 in Belgium; 15,000 in Poland and Sweden, and 7,500 tuns in Holland.

It is stated that the New Jersey Central Railroad has appointed a number of district surgeons along the line of their road to give prompt attention to sufferers in accidents.

The Pacific Mail Steamship Company, have shipped from Baltimore 3,220 tuns of coal to Japan, 3,892 to San Francisco, and 803 tuns to Hong Kong.

A Western paper says that solid masses of gold underlie the Rocky Mountains. All that is wanted to secure it is an "eligible hole."

The snow shed of the Central Pacific Railroad is the biggest building in the world. It is 16 feet wide, 16 feet high, and 22 miles long, and took about forty million feet of lumber.

The Sault Ste. Marie Canal has been ceded to the United States by the State of Michigan.

Four thousand million pounds of rags are estimated to be made annually into paper in the world.

Our English exchanges are full of brag over their new iron clad, the *Hercules*. They claim that she is the swiftest and most powerful vessel afloat.

A triple barrel gun has been invented in Pittsfield, Mass., two barrels for shot and one for ball.

France during the last year exported two hundred thousand dollars worth of velocipedes.

Glass mold boards for plows to resist corroding soils are said to have been recently invented.

Indiana is said to have eight thousand square miles of iron and coal lands.

Miners are again beginning to work the old and deserted lead mines of Dubuque.

Marbleizing slate is now extensively carried on in the Vermont quarries.

A firm at Bridgeport, Conn., are turning out forty velocipedes weekly.

France has a corps of 266,166 fireman, who manage 12,720 fire engines.

Gold, it is reported, has been found in Bureau county, Illinois.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

POTATO DIGGER.—Ira Curtis, Des Moines, Iowa.—The object of this invention is to provide for public use, a simple, cheap, and effective machine, which will dig the tubers, cleanse them from dirt, and empty them into a bag or basket.

LIFE PRESERVER.—James Bond, Norfolk, Va.—The object of this invention is to provide for public use a convenient, simple, and cheap apparatus, which, in cases of accident on the water, can be readily attached to the person, and by which anyone can easily and comfortably support himself in the water and at the same time propel himself rapidly along in any desired direction.

MACHINE FOR GILDING.—James Lick, San Francisco, Cal.—This invention has for its object to furnish a simple and convenient machine for gilding, by means of which the surface to be gilded may be applied to the gold leaf while in the book, thus rendering the ordinary cutting and handling of the gold leaf wholly unnecessary.

MOWING MACHINE.—Charles D. Mansfield, Lynn, Mass.—This invention has for its object to furnish a neat, simple, convenient, and effective mowing machine, which shall be constructed and arranged, that while doing its work quickly and thoroughly, it will have less side draft, and less wear and tear of the machinery, than mowing machines constructed in the ordinary manner.

SLEIGH BRAKE.—John Maxson and Warren Kinyon, Scott, N. Y.—This invention has for its object to furnish an improved sleigh brake, designed especially for bob sleighs, but equally applicable to other sleighs, and which shall be so constructed that it may be conveniently reached and operated by the driver, and which will be entirely out of the way.

COMBINED TABLE SINK AND DISH.—Thomas Ireland, Negaunee, Mich.—This invention has for its object to furnish an improved apparatus by means of which the laborious and disagreeable operation of dish washing may be greatly facilitated.

WHEELED VEHICLES.—Samuel Jackson, Newark, N. J.—This invention called by the inventor an "Oscillating Wheel Carriage," has for its object to so improve the construction of the running parts of wagons, and other vehicles, that they may be easier for the horses, easier for those riding in them, and easier upon the vehicles themselves, making them less liable to be broken should one or more of the wheels strike an obstruction.

CORN PLANTER.—Nathan Breed, Jeffersonville, Ind.—This invention has for its object to furnish a simple, convenient, accurate, and effective machine for planting corn, which shall be so constructed and arranged that it may be readily made to plant the corn in accurate check row.

BAND DRAWER.—B. W. Field, Ferrisburgh, Vt.—This invention has for its object to furnish a simple, convenient, and powerful instrument for drawing the patent wire bands, or other bands, upon bales of hay, straw, broom-corn, cotton, or other materials, put up in bales, and which shall, at the same time, be so constructed as to be conveniently operated.

COMBINATION TOOL.—Edwin Froggatt, Central City, Colorado.—This invention relates to a new tool, which is to be used by blacksmiths, and other mechanics, for various purposes, and in which the most important tools, namely, the hammer, screw-driver, wrench, and pincers are combined in such manner that either can be used with great facility.

ATTACHMENT FOR SEWING MACHINES.—H. M. Hall, Danby, Vt.—The object of this invention is to provide an attachment for sewing machines which by the permutation of its devices will hold or guide the goods in any one of the several operations, such as the operation of seaming, binding braiding, tucking and marking, gathering, hemming, quilting, stitching and others.

TWEER.—J. C. Wilson, Coalburg, West Va.—This invention relates to improvements in tweers, having for its object to provide an arrangement whereby two fires may be blown simultaneously from the one tweer, for convenience in heating large work, or two large pieces, for welding.

CRATE.—L. A. Lindsey, and J. F. O'Sullivan, Jackson, Miss.—This invention relates to improvements is packages for shipping fruit, vegetables, poultry, and for other purposes, whereby it is designed to provide crates of simple and cheap construction, which may be readily folded, so as to occupy but little space, when it is desired to transport them empty or to store them.

NUT LOCKING DEVICE.—P. Philippi, Beardstown, Ill.—This invention relates to improvements in nut locking devices for preventing the nuts from becoming loose upon fastening bolts, and designed more particularly for locking the nuts of bolts used for fastening fish plates. It consists of a bar having mortises through it or notches in the ends, or sides, to fit the nuts, to be placed on the surface of the fish plate against which the nuts are screwed, so as to engage the nuts in the said notches or mortises, and being held in said position by a bolt or bolts, projecting from the said surface and held by spring keys, thereby locking the said nuts and preventing their disarrangement.

ONE-WHEELED VELOCIPEDE.—T. W. Ward, New York city.—This invention relates to certain improvements in that class of one-wheeled velocipedes, in which the driver's seat is arranged above the wheel, it being pivoted to the axle of the same. The invention has for its object to provide for an easy balancing of the frame, and consists in attaching weights to the lower end of the seat frame, whereby the same will be retained in a vertical position. The balance can with this weight attachment not be so readily lost as without, and the operation of the one-wheeled velocipede is made easier and more practicable.

COTTON SEED PLANTER.—D. H. A. Sanders, Senatobia, Miss.—This invention consists of a hollow, hexagonal cylinder, capable of vertical play, mounted on runners, with openings at the salient angles of the sides, in the center to deliver the seed in front, behind a grooved plow, and behind, in front of a scraping covering device, the seed delivered in front being covered by the said cylinder.

MACHINE FOR MAKING POWDER.—Wm. Silver, Bloomsburg, Pa.—This invention relates to improvements in the glaze barrels or cylinders commonly used for mixing the component parts of blasting and other powder, designed to ventilate the same, whereby the operation is rendered much safer and may be accomplished better and in less time. The invention consists in the application of spring valves to the cylinder, to be opened at certain periods of the revolution of the cylinder, to allow the escape of the damp and explosive gases generated within and the admission of fresh air.

THROTTLE VALVE.—Charles Doughty Allen, New York city.—The present invention relates to new and useful improvements in throttle valves, the same being operated upon by the governor, in such a manner that in the event of anything giving way or breaking, the throttle valve will immediately close and shut off the steam, and will also close itself should the engine run too fast, for as the balls of the governor raise they will draw the throttle shut.

PLUMB LEVEL AND GUIDE LINE HOLDER.—John Bryant, Akron, Ind.—This invention relates to new and useful improvements in an instrument or apparatus for plumbing and leveling for various purposes; and it consists in a novel construction and arrangement of parts.

APPARATUS FOR CLEARING SPIKED CANNON.—Thomas J. Dobbs, Weehawken, N. J.—This invention relates to a new and useful device for clearing the touch-hole of the cannon where a cannon has been spiked.

FIREARMS.—Richard S. Lawrence, Hartford, Conn.—This invention relates to new and useful improvements in firearms, having more particular reference to the class of firearms known as "Sharp's rifles," but which improvements (either in whole or in part) are applicable to other descriptions of firearms.

PREPARING TAN BARK.—N. Spencer Thomas, Painted Post, N. Y.—This invention relates to a new and useful improvement in the process of preparing bark for tanning purposes, whereby the tan bark used is freed from its impurities, and rendered much more suitable for the purpose intended than when prepared in the ordinary man

MEDICAL COMPOUND.—Mrs. A. W. Kidder, South Norridgewock, Me.—The object of this invention is to supply a simple and safe family medicine, which operates to cure or palliate all diseases arising from an impure state of the blood, by purifying and invigorating the blood. Its general effect is tonic and cleansing.

CULTIVATOR.—J. B. Jay, Arlington, Ill.—The object of this invention is to produce a cultivator, on which the shovels are made up and down adjustable, and at the same time, so hung that they can be slightly oscillated to avoid stones and other obstructions; another object is to protect the driver as well as the animal from excessive heat, or other inclemencies of the weather.

BIRD CAGE.—J. Maxheimer, New York city.—This invention relates to a new manner of connecting the top of a bird cage to the bottom of the same, with a view of utilizing material and of obtaining a better fastening. The invention consists in the application of a rod, which is fitted through an eye or loop, projecting from the bottom, and which rests on the upper edge of a band or ring of the cage top. This rod is not only a secure and economical fastening for the bottom, but forms, at the same time, a step or support for the bird.

PUMP.—Alexander Friedmann, Vienna, Austria.—This invention relates to a new pump for elevating or forcing water by means of steam; and has for its object to reduce the shock produced by suddenly bringing the steam in contact with the water. The condensation of steam is, in such pumps, generally so sudden, and the consequent reaction so great, that much power is thereby lost. This invention effects a very gradual condensation, and at the same time, also a gradual expansion of the steam column, so that there will be no reaction and loss, but only a clear gain of power.

CHURN.—J. E. Overacker, Redwood, N. Y.—This invention has for its object the construction of a churn, in which a current of air can in the most convenient manner be blown into the cream, beside using the most effective dashing apparatus. This combination of air and paddles, or dashers, will break the cream, and produce the butter much quicker than can be done by the dashing process alone. It will also cause a much more thorough buttering than could be done by the ordinary process, and will have less butter-milk.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,775.—PRESERVING MEAT AND ANIMAL MATTER, AND IN APPARATUS EMPLOYED FOR THAT PURPOSE.—Thomas Sim, Charleston, S. C. Dec. 12, 1868.

161.—PROPELLING MACHINERY FOR CANAL BOATS AND OTHER VESSELS.—Frederick R. Pike, New York city. Jan. 18, 1869.

372.—MACHINERY OR APPARATUS FOR CUTTING WIRE AND RODS OF METAL AND OTHER MATERIALS.—W. C. Flinn, Nashua, N. H. Feb. 6, 1869.

451.—APPARATUS FOR FORMING METALLIC JOINTS OR SEAMS OF TIN OR OTHER SHEET METAL.—Joseph Le Comte, Brooklyn, N. Y. Feb. 13, 1869.

762.—PRESERVATIVE PAINT.—Wm. Babcock, San Francisco, Cal. March 12, 1869.

788.—TRAVERSE CARD GRINDER.—S. H. Wright, Lowell, Mass. March 15, 1869.

794.—STEAM VESSELS FOR OCEAN AND RIVER NAVIGATION.—S. W. Wilson, New York city, March 15, 1869.

816.—SAFETY HOOK FOR HARNESS, ETC.—Austin Baldwin, New York city March 17, 1869.

828.—ANCHORS.—J. D. Green, Cambridge, Mass. March 18, 1869.

874.—MACHINERY FOR FELTING FELT CLOTHS.—J. T. Waring, Yonkers N. Y. March 22, 1869.

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Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING APRIL 6, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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On filing each application for a Patent (seventeen years).....$15
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On granting the Extension.....$50
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On an application for Design (three and a half years).....$10
On an application for Design (seven years).....$15
On an application for design (fourteen years).....$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years.....$1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from.....$1
upward, but usually at the price above named.
The full Specification of any patent issued since Nov. 20, 1866, *at which time the Patent Office commenced printing them*.....$1·25
Official Copies of Drawings of any patent issued since 1836, *we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.*
Full information, as to price of drawings, in each case, may be had by addressing
MUNN & CO.,
Patent Solicitors, No. 37 *Park Row, New York*

88,535.—ROCK-SHAFT FOR GANG SAWS.—Ashbel P. Barlow, Kalamazoo, Mich.
88,536.—CAN OPENER.—F. G. Beach, Hartford, Conn.
88,537.—TONIC BITTERS.—Robert Blacklidge, Bridgeport, Conn., assignor to himself and Charles Gerdenier.
88,538.—SUBMERGED PUMP.—Alonzo C. Blethen, Lynn, Mass.
88,539.—SCREW.—Carl Bocking (assignor to himself and Coates Walton), Philadelphia, Pa.
88,540.—BREECH-LOADING FIREARM.—Francis E. Boyd and P. Shelton Tyler, Boston, Mass.
88,541.—BANJO.—Levi Brown, Baltimore, Md.
88,542.—HYDRANT.—Samuel G. Cabell, Quincy, Ill., assignor to himself and Abbott Q. Ross.
88,543.—REEFING FORE-AND-AFT-SAILS.—Robert Chambers, Detroit, Mich.
88,544.—CASTING HANDLES OF TABLE CUTLERY.—Nathan S. Clement, New Britain, Conn
88,545.—MANUFACTURE OF ARTIFICIAL STONE.—François Coignet, Paris, France, assignor to L. Mangeon, New York city.
88,546.—ARTIFICIAL MONOLITHIC STRUCTURE.—François Coignet, Paris, France, assignor to L. Mangeon, New York city.
88,547.—MAKING ARTIFICIAL STONE AND MONOLITHIC STRUCTURES.—François Coignet, Paris, France, assignor to L. Mangeon, New York city.
88,548.—MODE OF TREATING AND MANIPULATING CEMENTS IN THE MANUFACTURE OF ARTIFICIAL STONE.—François Coignet, Paris, France, assignor to L. Mangeon, New York city.
88,549.—PROCESS OF FORMING ARTIFICIAL STONE.—François Coignet, Paris, France, assignor to L. Mangeon, New York city.
88,550.—SEAL LOCK.—G. M. Cooper, Port Huron, Mich.
88,551.—EDGE PLANE FOR BOOT SOLES.—Charles Coti (assignor to himself and John Baptiste Bebo), Marlborough, Mass.
88,552.—PUMP.—John C. Crawford, Clintonville, Ill.
88,553.—CRADLE, OR CRIB.—Eliza N. Cutter, Chicago, Ill. Antedated April 2, 1869.
88,554.—MEDICINE FOR CURE OF THE GRAVEL.—Benjamin W. Deal, New Market, Md.
88,555.—BANJO.—Frank P. Dobson, New York city.
88,556.—SPINDLE STEP FOR SPINNING MACHINES.—George Draper, Hopedale, Mass.
88,557.—EQUALIZING CULTIVATOR.—Mathias Eichholtz, Troy, Ohio.
88,558.—CASTER.—Wm. P. Elliott, Cincinnati, Ohio.
88,559.—MOLD FOR CASTING AUGERS.—William Evans and Richard E. Hayden, Seymour, Conn.
88,560.—WRENCH.—Orlando V. Flora, Madison, Ind., assignor to himself and Charles Alling. Antedated March 23, 1869.
88,561.—COMPOUND FOR WELDING AND RESTORING STEEL.—G. W. Fox, H. H. Coe, and I. M. Kelley, Ravenna, Ohio.
88,562.—NECK YOKE.—Hiram E. Goble, Lake Mill, Mich.
88,563.—SCHOOL DESK AND SEAT.—George Huntress Grant, Richmond, Ind.
88,564.—BARREL TRUCK.—Eugene Grosjean, Pittsburgh, Pa., assignor to himself, Jacob Weaver, Jr., and Alfred H. Jones.
88,565.—SHUTTER OPERATOR AND FASTENER.—George A. Harris and John B. Harris, Salem county, N. J.
88,566.—CLOTHES DRYER.—Elmer Hause, Tecumseh, Mich.
88,567.—SPRING HINGE.—V. S. Herzog, Baltimore, Md.
88,568.—CHURN.—Charles Hess, Lyons, Iowa.
88,569.—FARM GATE.—Edward Hill, Charles Ostrander, and Horatio A. Spink, Bainbridge, Mich.
88,570.—PROCESS OF PREPARING BLUE PEROXIDE OF MANGANESE.—James W. Hobbs (assignor to Hobbs, Pope & Co.), Boston, Mass.
88,571.—ANCHOR TRIPPER.—James B. Hopkins, Dennis Port, Mass. Antedated March 23, 1869.
88,572.—WEATHER STRIP.—Joseph Johnston, Chicago, Ill.
88,573.—SASH HOLDER.—Morton Judd, New Haven, Conn.
88,574.—VELOCIPEDE.—Wm. Lindon, New Haven, Conn.
88,575.—GATE.—S. L. Marsden, New Haven, Conn.
88,576.—BRAIDING MACHINE.—George Mason, Providence, R. I.
88,577.—DOOR LOCK.—R. McDowell, Lambertville, N. J.
88,578.—MODE OF CONSTRUCTING BUILDING FRONTS.—Isaac S. Miller, New York city. Antedated March 23, 1869.
88,579.—TUB-BORING MACHINE.—Daniel Murphy, Dubuque, Iowa.
88,580.—TEASEL TRIMMER.—Charles G. Nye, Onondaga, N. Y.
88,581.—LOCK FOR SAFE DOORS, ETC.—David O. Paige, Detroit, Mich.
88,582.—COMB.—Henry M. Paine, Newark, N. J.
88,583.—FIRE EXTINGUISHER.—William M. Parker, Boston, Mass.
88,584.—BEER COOLER.—Herman Pietsch and Moritz Walter, Milwaukee, Wis.
88,585.—PROCESS OF HARDENING STEEL PLATES, ETC.—George H. Porter (assignor to Porter Saw Company), Bristol, Conn.
88,586.—FELLOE SAWING MACHINE.—John Rice, Bloomington, Ind.
88,587.—BOOK-BINDERS' HEAD BAND.—Julius Schlichting, New York city.
88,588.—PEG-CUTTER FOR BOOTS AND SHOES.—William H. Sellers, Keokuk, Iowa.
88,589.—ANTI-FREEZING HYDRANT.—John W. Slocum, Philadelphia, Pa.
88,590.—METHOD OF MAKING YEAST.—George Terry, Providence, R. I.
88,591.—COMBINED HOE AND FORK.—Benjamin L. Tibbets, South China, Me.
88,592.—DOOR PULLEY.—Peter Joseph Tillmann (assignor to himself and John Reiser), Trenton, N. J.
88,593.—HORSE HAY FORK.—J. F. Troxel, Bloomville, Ohio.
88,594.—QUILTING FRAME.—I. W. Valance, Troy, N. Y.
88,595.—PROPELLER.—Chas. Ward (assignor to himself and C. B. Palmer), Detroit, Mich.
88,596.—STUMP EXTRACTOR.—J. A. Woodworth, Hickory Corners, Mich.
88,597.—CARRIAGE TOP.—R. H. Wright, New Bloomfield, Pa.
88,598.—FLUTING MACHINE.—H. B. Adams, New York city.
88,599.—THROTTLE VALVE FOR STEAM ENGINES.—Charles D. Allen, New York city.
88,600.—RAILROAD CAR BUFFER.—Peter Allen and Benjamin Valiquette, Rutland, Vt.
88,601.—ATTACHING SLEIGH RUNNERS TO STREET CARS.—B. Agrbach, New York city.
88,602.—FASTENER FOR SECURING SPRINGS TO BED BOTTOMS AND MATTRESSES.—J. S. Barnum, Topeka, Kansas.
88,603.—SEWING MACHINE.—Chas. E. Billings, Hartford, Ct.
88,604.—CORN PLANTER.—Nathan Breed, Jeffersonville, Ind.
88,605.—BREECH-LOADING FIREARM.—Wm. Briggs, Norristown, Pa.
88,606.—LINE HOLDER.—John Bryant (assignor to himself and A. L. Bailey), Akron, Ind.
88,607.—HAND CORN PLANTER.—Geo. Burson, East Palestine, Ohio.
88,608.—TOY PISTOL.—Asa L. Carrier, Washington, D. C.
88,609.—FOLDING DESK.—Aaron Chandler, Davenport, Iowa.
88,610.—SYPHON BOTTLE.—C. J. Converse (assignor to himself and James W. Tufts), Medford, Mass.
88,611.—FERRULE FOR BOILER TUBES.—Robert A. Copeland, Brooklyn, N. Y.
88,612.—COFFEE ROASTER.—Lyman B. Crittenden, Pittsburg, Pa.
88,613.—POTATO DIGGER.—Ira Curtis, Des Moines, Iowa.
88,614.—TEA-KETTLE BREAST.—Z. Dixon, Bristol, Ill.
86,615.—APPARATUS FOR UNSPIKING GUNS.—T. J. Dobbs, Weehawken, N. J.
88,616.—LADDER.—R. L. Dodge, Portland, Me.
88,617.—BEDSTEAD FASTENER.—Justus Doering, Philadelphia, Pa. Antedated March 25, 1869.
88,618.—RAIN-WATER CONDUCTOR.—J. D. Field, Wataga, Ill.
88,619.—ELASTIC LINK FOR CLEVIS.—Louis Fliedner, Cleveland, Ohio.
88,620.—STEAM PUMP.—Alex. Friedmann, Vienna, Austria.
88,621.—WRENCH AND PINCHERS.—Edwin Froggatt, Central City, Colorado Territory.
88,622.—MARINE FURNITURE.—Edward Gallier, St. Louis, Mo.
88,623.—WRENCH.—G. P. Ganster, New York city.
88,624.—TEMPLET FOR BENDING SPRINGS.—Joseph Gatchell, Rahway, N. J.
88,625.—DOOR SPRING.—Wm. Gilfillan, Syracuse, assignor to himself and M. T. Van Horn, New York city.
88,626.—EAVES TROUGH BRACKET.—J. W. Gillespie, Alliance, Ohio.
88,627.—COTTON CULTIVATOR.—A. J. Going, Clinton, La.
88,628.—SHIP'S RUDDER.—T. F. Goodwin, E. C. Goodwin, and Chas. E. Goin, New York city.
88,629.—CHURN POWER.—I. S. Goolman, Monrovia, Ind.
88,630.—ATTACHMENT FOR SEWING MACHINE.—H. M. Hall, Danby, Vt.
88,631.—CLOTHES DRYER.—Asa P. Hawse and G. R. Shippy, Wolcott, Vt.
88,632.—COLLAR ATTACHMENT FOR SCREWS.—James Hooper, Pittsburgh, Pa.
88,633.—MOLDING COMPOSITION TO IMITATE IVORY AND OTHER SUBSTANCES.—J. W. Hyatt, Jr. (assignor to the Hyatt Manufacturing Company), Albany, N. Y. Antedated March 25, 1869
88,634.—METHOD OF COATING BILLIARD BALLS, ETC.—J. W. Hyatt, Jr. (assignor to the Hyatt Manufacturing Company), Albany, N. Y.
88,635.—GRINDING AND CLEANING CARD CYLINDERS.—W. B. Ingram (assignor to himself and Keeney Brothers), Manchester, Conn.
88,636.—COMBINED SINK AND DISH WASHER.—Thomas Ireland, Negaunee, Mich.
88,637.—CARRIAGE.—Samuel Jackson, Newark, N. J.
88,638.—CULTIVATOR.—J. B. Jay, Arlington, Ill.
88,639.—RUBBER COMPOUND.—John Johnson, Brooklyn, N. Y.
88,640.—WEATHER STRIP FOR WINDOWS.—Joseph Johnston, Chicago, Ill.
88,641.—EGG CARRIER.—P. P. Josef, Buffalo, N. Y. Antedated January 11, 1869.
88,642.—APPARATUS FOR THE MANUFACTURE OF VINEGAR.—F. E. Josel, Freeport, Ill.
88,643.—CHAIN.—J. George Jung, Newark, N. J.
88,644.—MEDICAL COMPOUND.—A. W. Kidder, South Norridgewock, Me.
88,645.—BREECH-LOADING FIREARM.—R. S. Lawrence (assignor to the Sharp's Rifle Manufacturing Company), Hartford, Conn.
88,646.—MACHINE EOR GILDING.—James Lick, San Francisco, Cal.
88,647.—FRUIT CRATE.—L. A. Lindsey and J. F. O'Sullivan, Jackson, Miss.
88,648.—FARE BOX FOR RAILROAD CARS.—R. H. Long, Philadelphia, Pa. Antedated March 22, 1869.
88,649.—INDEX FOR FILING CIRCULAR SAWS.—J. B. Machamer, New Baltimore, Ohio.
88,650.—MOWING MACHINE.—C. D. Mansfield, Lynn, Mass.
88,651.—CONSTRUCTING PICTURE FRAMES.—D. W. Marshall, Pawtucket, R. I.
88,652.—MACHINE FOR FORGING WROUGHT NAILS.—H. W. Mather, Deep River, Conn.
88,653.—MOWING MACHINE.—N. F. Mathewson, Barrington, assignor to himself and Henry Armington, Providence, R. I.
88,654.—BIRD CAGE.—J. Maxheimer, New York City.
88,655.—SLED BRAKE.—John Maxson, and Warren Kinyon, Scott, N. Y.
88,656.—FOUNTAIN PEN.—Franzis A. Odermatt and Frank Etlin, San Francisco, Cal.
88,657.—PORTABLE HOUSE.—W. R. Mears, Grafton, Ill.
88,658.—MODE OF DEODORIZING THE SPENT LIME OF GAS WORKS.—Adolph Millochau, New York city.
88,659.—WEEDING HOE.—J. S. Munger, Olean, N. Y.
88,660.—MODE OF PREPARING SHEET COPPER FOR BOILERS AND OTHER VESSELS.—Andrew O'Neill, Portsmouth, Ohio.
88,661.—COMPOSITION FOR COVERING STEAM BOILERS AND LINING SAFES.—Adolph Ott, New York city.
88,662.—CHURN.—J. E. Overacker, Redwood, N. Y.
88,663.—WASHING MACHINE.—G. N. Palmer (assignor to H. Carter), Green, N. Y.
88,664.—DEVICE FOR MOWING AWAY HAY.—L. E. Palmer, Le Roy, Pa.
88,665.—NEEDLE HOLDER FOR SEWING MACHINES.—Charles Parham and G. A. Smith, Philadelphia, Pa.
88,666.—MEAT CUTTER.—J. G. Perry, Kingston, R. I.
88,667.—MEAT CUTTER.—J. G. Perry, Kingston, R. I.
88,668.—NUT-LOCKING DEVICE.—P. Philippi, Beardstown, Ill.
88,669.—COMBINED HARROW AND CULTIVATOR.—J. R. Ross and W. D. Mitchell, Centralia, Ill.
88,670.—COTTON SEED PLANTER.—D. H. A. Sanders, Senatobia, Miss.
88,671.—WINDOW SHADE FIXTURE.—Hermann Schulte, Milwaukee, Wis.
88,672.—EGG BEATER.—C. F. A. Seitz (assignor to himself and Louis Wagner), Philadelphia, Pa.
88,673.—FLOOD GATE.—S. B. Shoup, Dayton, Ohio.
88,674.—MACHINE FOR MAKING BLASTING AND OTHER POWDER.—Wm. Silver, Bloomsburg, Pa.
88,675.—CAR STARTER.—J. F. Stokes, Philadelphia, Pa.
88,676.—CLIP FOR NECK YOKE AND WHIFFLETREE.—Z. T. Sweet, Eugene City, Oregon.
88,677.—APPARATUS FOR COOLING MILK.—J. L. Tallman and J. V. De Puy, Tecumseh, Mich.
88,678.—PREPARING TAN BARK.—N. S. Thomas, Painted Post, N. Y.
88,679.—DEVICE FOR GRINDING EDGED TOOLS.—H. K. Trask, Beaver Dam, Wis.
88,680.—MEDICAL COMPOUND.—T. S. Tuggle, Columbus, Ga.
88,681.—MEDICAL COMPOUND.—T. S. Tuggle, Columbus, Ga.
88,682.—DENTAL PLATE.—Henry Twitchell, Pulaski, N. Y.
88,683.—VELOCIPEDE.—T. W. Ward, New York city.
88,684.—BOOK COVER.—W. C. Wendell, Albany, N. Y.
88,685.—RAILWAY CAR COACH.—G. W. Williamson, Goldsborough, Pa.
88,686.—ROTARY ROAD SCRAPER.—J. W. Wilson, Somerford, Ohio.
88,687.—TWEER.—J. C. Wilson, Coalburg, W. Va.
88,688.—CHURN DASHER.—T. H. Withers and J. Dolfinger, Louisville, Ky. Antedated April 1, 1869.
88,689.—PROJECTILE.—John Absterdam, New York city.
88,690.—GRAIN SEPARATOR.—Peleg Barker, Battle Creek, Mich., assignor to himself and the Joliet Manufacturing Company, Joliet, Ill.
88,691.—DEVICE FOR ADJUSTING GEARING.—G. S. Barton (assignor to Rice, Barton, and Fales Machine and Iron Company), Worcester, Mass.
88,692.—LIFE-PRESERVING APPARATUS.—James Bond, Norfolk, Va.
88,693.—APPARATUS FOR MELTING SNOW.—N. H. Borgfeldt, New York city.
88,694.—STEAM GENERATOR.—H. J. Bruner, Nazareth, Pa.
88,695.—SYRINGE.—W. J. Davidson, Staunton, Va.
88,696.—ROCK DRILL.—C. H. Davis, Troy, N. Y.
88,697.—POLE FOR STRETCHING LEATHER.—Hugh Dawson Baltimore, Md.
88,698.—FIRE ALARM.—Charles Dion, New York city.
88,699.—NEEDLE THREADER FOR SEWING MACHINES.—H. W Dopp, Buffalo, N. Y.
88,700.—BONE-BLACK KILN.—E. P. Eastwick, Baltimore, Md.
88,701.—KILN FOR BURNING BONE-BLACK.—E. P. Eastwick, Baltimore, Md.
88,702.—KILN FOR BONE-BLACK.—E. P. Eastwick, Baltimore Md.
88,703.—VELOCIPEDE.—H. J. Ferguson, Whiting, N. J.
88,704.—SLED-WAY ATTACHMENT FOR COVERED ROADWAYS.—J. B. Foote, Hamden, assignor to A. Buckham, Delhi, N. Y.
88,705.—CARRIAGE WHEEL.—C. M. Foulke, Philadelphia, Pa
88,706.—MANUFACTURE OF VULCANIZED RUBBER BOOTS AND SHOES.—J. A. Greene, Brooklyn, N. Y., assignor to himself and John H Young, Beverly, Mass.
88,707.—STEAM GENERATOR.—Alfred Guthrie and Carlile Mason, Chicago, Ill.
88,708.—CORN HUSKER.—H. L. Hall, Woodbridge, Iowa.
88,709.—FLUID METER.—A. Heaton (assignor to himself and Bradbury & Goodsell), Bridgeport, Conn.
88,710.—GRAIN DRILL.—P. F. Hodges, St. Paul, Minn.
88,711.—ROLLER SKATE.—Isaac Hodgson, Indianapolis, Ind.
88,712.—PLASTERING TROWEL.—P. J. Hogan, Cincinnati, Ohio.
88,713.—LANTERN.—Thomas Houghton, Philadelphia, Pa.
88,714.—STEAM ENGINERY FOR STEAM VESSELS.—JohnHowe, Jr., Boston, Mass.
88,715.—MATERIAL FOR PAINT.—W. H. Hubbard (assignor to himself and John Hill), West Meriden, Conn
88,716.—THRESHING MACHINE.—S. D. Huffman, New Germantown, N. J.
88,717.—NEEDLE THREADER.—Alex. Hunter, Buffalo, N. Y.
88,718.—COMBINED CLOCK AND FLY TRAP.—Chas. Kallmann, Newburg, N. Y.
88,719.—HORSE RAKE.—C. P. Kelley, Phelps, N. Y.
88,720.—CARRIAGE HUB.—George Kenney, Nashua, N. H.
88,721.—WAGON BRAKE.—August Kessberger, Springfield, Ill
88,722.—ENVELOPE.—A. A. C. Klaucke, Washington, D. C., and Jefferson Fraser, New York city.
88,723.—SHOVEL PLOW.—Eli Knepper, Columbus, Ohio.
88,724.—GRAIN CRADLE.—W. H. Locke, Canton, Pa.
88,725.—MODE OF FINISHING AND TRUING EMERY WHEELS, etc.—Clark Marsh, Bridgeport, Conn., assignor to the New York Belting and Packing Co.
88,726.—PIE CUTTER AND CRIMPER.—Henry Matthes, Cambridge, Mass.
88,727.—COTTON-BALE TIE.—Wm. M. Morris, Washington county, Miss.
88,728.—METALLIC COFFIN.—George Nearstheimer, Cincinnati, Ohio.
88,729.—PIANOFORTE FRAME.—G. W. Neill (assignor to Chickering and Sons), Boston, Mass.
88,730.—BREECH-LOADING FIREARM.—J. D. S. Newell, Tensas parish, assignor to himself, N. G. Brice, E. Tomatis, and Thomas Pickle, New Orleans, La.
88,731.—SUSPENDER.—G. H. Palmer, Lewisham parish, Eng., assignor to himself and Samuel Nichols, New Haven, Conn.
88,732.—POWER PRESS.—W. F. Parker, Meriden, Conn.
88,733.—MECHANICAL ADJUSTMENT.—R. B. Perkins (assignor to Charles Parker), Meriden, Conn.
88,734.—MECHANICAL ADJUSTMENT.—R. B. Perkins (assignor to Charles Parker), Meriden, Conn.
88,735.—SHOE JACK FOR FINISHING SHOES.—J. E. Plummer, Binghamton, N. Y.
88,736.—CAR COUPLING.—A. Ray, Granville, Mo.
88,737.—COMBINED KNOB LATCH AND LOCK.—F. Raymond, Woodhaven, N. Y.
88,738.—VELOCIPEDE.—J. B. Read, Tuscaloosa, Ala.
88,739.—COMBINED CLOTHES DRYER AND IRONING TABLE.—Wm. Reichenbach (assignor to himself and Henry Nass), Chicago, Ill.
88,740.—HARROW AND CULTIVATOR.—E. S. Rice, Paw Paw, Mich.
88,741.—APPARATUS FOR DESULPHURIZING AND OXIDIZING ORES.—J. M. Rohrer, Pine Grove, Penn.
88,742.—BURRING CYLINDER FOR WOOL, ETC.—C. G. Sargent, Westford, Mass.
88,743.—RAILWAY CAR WHEEL.—J. K. Sax and G. W. Kear, Kingston, Pa.
88,744.—STOVEPIPE DAMPER.—H. J. Sayers, Salina, Pa.
88,745.—FIRE AND WATER-PROOF CEMENT.—S. R. Scharf, Baltimore, assignor to himself, James Spicer, and J. N. Burnham, Baltimore county, Md.
88,746.—ASPHALTIC PAVEMENT.—Samuel R. Scharf, Baltimore, assignor to himself, James Spicer, and James N. Burnham, Baltimore county, Md.
88,747.—MANUFACTURE OF ARTIFICIAL STONE.—J. J. Schillinger, New York city.
88,748.—CARRIAGE WHEEL.—Caleb S. Stearns, Marlborough, Mass.
88,749.—SOUND-BOARD FOR PIANOFORTES.—C. F. T. Steinway, New York city.
88,750.—VELOCIPEDE.—C. W. Stickney, Albany, N. Y.
88,751.—WOOD-PULLEY BUSH.—T. B. Stout, Keyport, N. J.
88,752.—CORSET CLASP.—Ferdinand Strauss, New York city.
88,753.—MACHINE FOR MAKING WROUGHT NAILS.—John Taggart, Boston, assignor to David Whiton, Boston, and B. F. Wing, West Roxbury, Mass.
88,754.—HORSE HAY FORK.—A. G. Thomas, Sandy Spring, Md.
88,755.—APPLE SLICER AND CORER.—Nathaniel Thomas, Dixfield, Me.
88,756.—PARLOR GAME.—Eugene Trump, Cincinnati, Ohio, assignor to himself and Leander Detwiler.
88,757.—MACHINE FOR SHEETING AND PRESSING TOBACCO.—William H. Watson, Brooklyn, N. Y., assignor to A. Sidney Doane, New York city.
88,758.—CULTIVATOR.—H. J. Wattles, Rockford, Ill.
88,759.—VELOCIPEDE.—J. W. Weston, New York city.
88,760.—BIT AND AUGER.—Cornelius Whitehouse, Bridgetown-near-Cannock, England.
88,761.—CAPSTAN.—C. L. Willis (assignor to himself and G. P Goff), Washington, D. C.
88,762.—TYPE CASE.—B. O. Woods, Boston, Mass.
88,763.—SASH PULLEY.—A. F. Hines, Washington, D. C.
88,764.—PROCESS AND APPARATUS FOR TANNING.—Edward Lynch, Georgetown, D. C.
88,765.—LAYING WOODEN-BLOCK PAVEMENT.—D. L. DeGolyer, Chicago, Ill.
88,766.—WEATHER STRIP.—J. H. Morris, Philadelphia, Pa.

REISSUES.

75,110.—MANUFACTURE OF GLASSWARE.—Dated March 3, 1868; reissue 3,357.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.
78,925.—LARD COOLER.—Dated June 16, 1868; reissue 3,358.—George Carleton Cassard, Baltimore, Md., (L. and J. L. Cassard, assignees of G. C. Cassard).
56,908.—GOVERNOR.—Dated August 7, 1866; reissue 3,359.—John Degnon, Cleveland, Ohio.
28,941.—SKELETON SKIRT.—Dated June 26, 1860; reissue 3,360. J. B. Loomis, Chelsea, Mass., assignee, by mesne assignments, of S. S Sherwood, New York city.
21,161.—REDUCING WOOD FIBER TO PAPER PULP.—Dated August 10, 1858; Antedated August 29, 1856; reissue 3,361.—Alberto Pagenstecher, Curtisville, Mass., Assignee of Henry Voelter.
35,058.—COOKING STOVE.—Dated June 17, 1862; reissue 3,362. D. S. Quimby and D. S. Quimby, Jr., Brooklyn, N. Y., assignees of S. R Going.
38,794.—MACHINE FOR OPENING AND CLEANING COTTON.—Dated June 2, 1863; reissue 3,363.—J. E. Van Winkle, Paterson, N. J.

DESIGNS.

3,441.—GUIDE AND FRICTION BRAKE FOR SHUTTLE LOOMS.—Wm. Atkinson, Philadelphia, Pa.
3,442.—BASKET RACK FOR RAILROAD CARS.—W. G. Creamer, Brooklyn, N. Y.
3,443.—TOBACCO BOX.—Charles Parker, Meriden, Conn.
3,444.—TRADE MARK.—Alfred Ray (assignor to Marshall Field and Levi Z. Leiter), Chicago, Ill.
3,445.—COFFEE MILL.—Joseph Sedgebeer, Painesville, Ohio.

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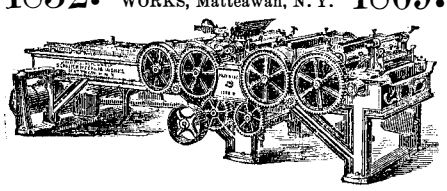

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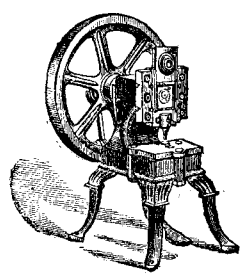

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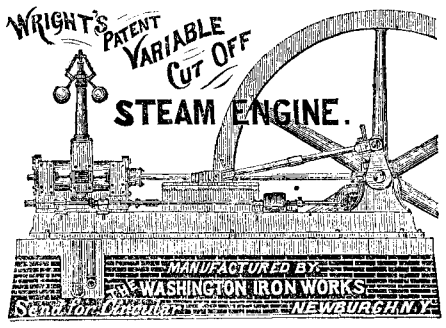

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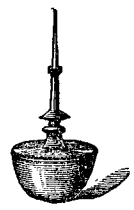

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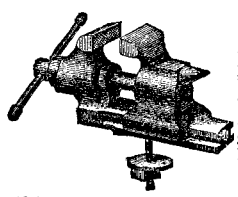

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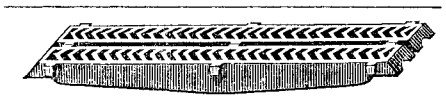

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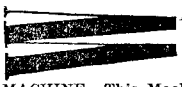

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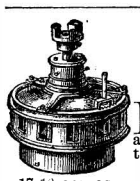

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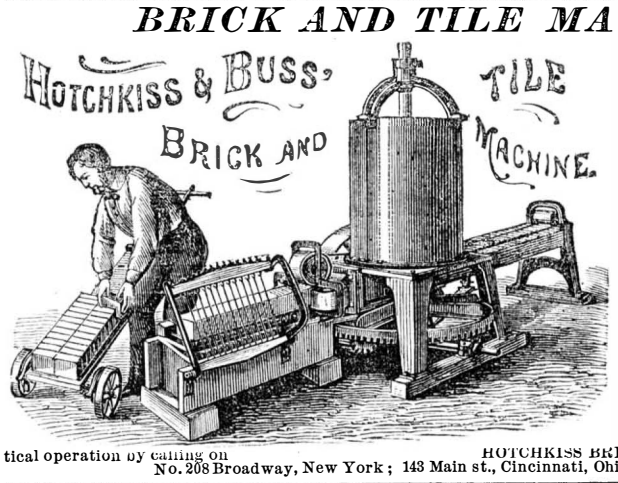

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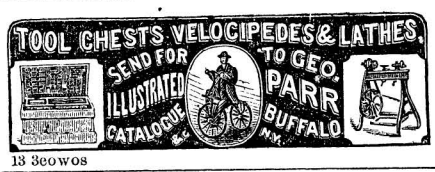

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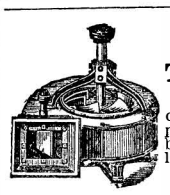

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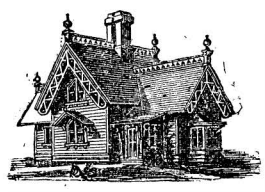

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